UNIVERSIDADE DE LISBOA
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3G FACEBOOK – SOCIAL NETWORKS FOR THE ELDERLY

Gonçalo Gomes da Silva Santos das Graças

DISSERTAÇÃO

MESTRADO EM ENGENHARIA INFORMÁTICA
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Orientador: Prof. Doutor Carlos Alberto Pacheco dos Anjos Duarte

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Resumo

Uma mudança demográfica está a decorrer tanto na União Europeia (UE) como em outras nações e países industrializados. A população mundial está cada vez a envelhecer mais e como consequência, os índices de dependência que os idosos revelam estão notoriamente a aumentar. O aumento da longevidade é algo que também está a alterar a distribuição etária da população em relação aos grupos etários mais velhos e depois de 2010, tal mudança vai acelerar o seu ritmo na maioria dos países industrializados, à medida que os "baby boomers" começarem a atingir a idade dos sessenta e cinco anos. Alguns países – tais como a Austrália, o Canadá, a França, a Alemanha, o Japão, a Nova Zelândia, o Reino Unido, e os Estados Unidos – estão a sentir os efeitos do envelhecimento das suas populações em diversas áreas, tais como gastos na área da saúde, políticas de reforma, uso de serviços de cuidados de longo prazo, composição da mão-de-obra e concretamente nas receitas. O processo de envelhecimento está geralmente relacionado com a entrada na reforma, que por sua vez traz solidão e isolamento. Vários trabalhos anteriormente desenvolvidos na área demonstram que estes sentimentos estão ligados a pessoas que não têm por hábito comunicar com a família e/ou amigos mais próximos, ou cujo número de contactos diminuiu significativamente nos últimos tempos. Já existe uma forte evidência de que tanto a frequência como a qualidade do contacto social que os idosos que estão isolados têm, afetam os seus níveis de saúde.

Uma das abordagens a ser tida em conta consiste na utilização das Tecnologias de Informação e Comunicação (TIC) para prestar assistência constante aos idosos, tendo como objetivo permitir-lhes manterem-se independentes, e nos seus próprios lares, por um período mais longo de tempo. Tais tecnologias têm sido usadas em diversos contextos diferentes, desde os cuidados de saúde até à segurança, passando pela comunicação ou até mesmo o lazer. Diversos trabalhos anteriores mostraram que os idosos são utilizadores frequentes das tecnologias, as quais estão continuamente a ser projetadas e desenhadas de modo a suportar uma vida ativa, garantindo assim a viabilidade para as próximas ideias. Tais ideias terão em vista uma perspetiva de construção de mecanismos de apoio para melhorar o uso das tecnologias por parte dos idosos. No entanto, os declínios a nível psicomotor, cognitivo e sensorial são notórios, sendo que estes aspectos diminuem naturalmente com o desenrolar do processo de envelhecimento, tornando as necessidades dos utilizadores idosos bastante diferentes comparativamente às dos utilizadores mais jovens.

Além disso, a sociedade normalmente tende a considerar os idosos como sendo demasiado velhos para aprender a utilizar as novas tecnologias, mas apesar disto e contrariamente ao que se supõe, vários investigadores descobriram que quando são aplicadas as estratégias adequadas e as mesmas são postas em prática, os idosos estão não só interessados, mas também completamente capazes de aprender a usar dispositivos móveis.

As potencialidades dos dispositivos touchscreen para os idosos têm sido investigadas ao longo do tempo, testadas em aplicações de investigação, que variam desde os sistemas de informação de saúde, até às redes sociais. Vários investigadores têm discutido as potenciais vantagens das interações baseadas em toque (touch-based interactions), tais como aquelas que os tablets oferecem, afirmando que este tipo de dispositivos fornece uma interação bastante mais fácil para os idosos. Tais estudos têm vindo a revelar que as interfaces sensíveis ao toque geralmente fornecem uma melhor naturais e intuitivas, o que proporciona uma interação imediata e uma melhor *user experience* e, como tal, as curvas de aprendizagem nessas interfaces são extremamente mais reduzidas.

Com o avanço da tecnologia e a proliferação dos serviços de comunicação, surgem novas necessidades para a criação de laços sociais e as oportunidades para redescobrir laços perdidos tornam-se também disponíveis para os utilizadores. As redes sociais (SNS) são um conjunto particular de social media, que se concentram principalmente no fornecimento de formas conectar os utilizadores uns com os outros. Estes serviços englobam também formas de construção da comunidades, com os utilizadores a interagirem uns com os outros fazendo uso das comunidades sociais, também conhecidas como plataformas de redes sociais (SNPs). O maior exemplo deste tipo de comunidades é o Facebook, onde as interações sociais geralmente compreendem uma vasta gama de comportamentos e atividades, tais como o envio e receção de mensagens, criar e comentar sobre eventos e todo o tipo de mecanismos de comunicação e interação. Estudos recentes mostram que o uso de plataformas como o Facebook, por permitirem a comunicação frequente e coletiva com os familiares mais próximos, aumentam o bem-estar e satisfação de vida, para além de reduzirem o isolamento. Por estas razões, a adoção das redes sociais pelos idosos aumentou consideravelmente nos últimos anos. Assim, esses serviços proporcionam um bom suporte para a criação de laços e relações, tal como foi demonstrado com o passar do tempo. Apesar de vários estudos terem apresentado várias formas de suportar a interação dos idosos e a sua comunicação, hoje em dia, muitos dos serviços representam ainda um desafio para os utilizadores mais idosos, maioritariamente devido ao facto de estes não serem simplesmente concebidos para eles, tendo um foco direto sobre o restante conjunto da população.

Assim sendo, revela-se aqui uma oportunidade pertinente para investigar maneiras de implementar uma interface que ofereça aos idosos uma melhor *user experience* e suporte para interação. Nesta dissertação, aumentámos ainda mais a compreensão de conceitos acerca dos idosos, das suas limitações e preferências ao interagir com a aplicação Mo-

bile do Facebook, a fim de fornecer recomendações que podem ajudar ao *design* de uma plataforma melhorada do Facebook Mobile - especificamente para tablets. Mais especificamente, esta pesquisa tem como objetivos: (1) investigar os desafios e preferências dos idosos ao interagir com a aplicação nativa do Facebook, (2) perceber como as preferências dos idosos quando interagem com a aplicação nativa do Facebook podem resultar em sugestões para a melhoria dessa mesma SNP, (3) traduzir tais sugestões na forma de recomendações para a conceção de um SNS móvel que vai de encontro aos requisitos dos idosos e se centra nas características desses mesmos utilizadores; (4) usar tais recomendações de *design* para implementar um protótipo baseado no Facebook, que fornece uma interface melhorada, focando-sena interação dos idosos com os SNS; (5) comparar a *user experience* dos idosos, tanto com o protótipo desenvolvido como com a aplicação nativa do Facebook, a fim de obter vários indicadores de usabilidade e acessibilidade.

Neste trabalho seguimos uma metodologia de desenvolvimento centrada no utilizador compreendendo três fases principais: caracterização das atividades principais realizadas por utilizadores idosos no Facebook; desenvolvimento de um protótipo que melhore o acesso de idosos ao Facebook; avaliação do protótipo comparativamente à aplicação móvel nativa do Facebook. Começámos o trabalho definindo claramente as questões de pesquisa e objetivos que se mapearam nestas três fases de desenvolvimento.

Numa primeira fase do trabalho, foram realizados estudos com utilizadores, a fim de entender e ter uma perceção clara de como é que ps idosos fazem uso do da rede social do Facebook. Os estudos com utilizadores foram feitos recorrendo a *focus groups* e entrevistas, os quais foram realizados em duas instituições – um Lar de Idosos e uma Universidade de Terceira Idade. Para além disso, foram também feitos estudos de *user experience* com dois participantes. Da primeira fase do nosso trabalho resultou um conjunto de requisitos que compreendem a interação dos idosos com as redes sociais móveis. A partir de tais requisitos foi-nos possível derivar diversas recomendações para o desenvolvimento de uma rede social focada nos utilizadores idosos. Tais recomendações apontaram para seis aspetos fundamentais: privacidade, grupos, foco na família, apresentação de conteúdos, interface e funcionalidades. Em relação a cada um dos aspetos, obtivemos bons indicadores de que uma SNS móvel que seja desenvolvida tendo em conta as necessidades dos idosos, deve considerar como foco a privacidade e as preocupações com a sua acessibilidade para os idosos, bem como o foco nas funcionalidades relacionadas com a família e/ou grupos. Além disso é importante manter também o foco na apresentação e filtragem de conteúdos, mais concretamente sobre aspetos de interface.

Numa segunda fase do nosso trabalho usámos os resultados que foram obtidos na fase anterior – respetivamente aos requisitos dos idosos relativos à sua interação com as SNS móveis – de modo a derivar um conjunto de recomendações para a conceção de um SNS móvel com foco nos idosos. Conseguimos detalhar essas recomendações usando a mesma

categorização utilizada na fase anterior. Para cada recomendação, explicamos em detalhe, que decisões de *design* foram levadas em consideração nesta fase, para que fosse levado a cabo o desenvolvimento do protótipo. Especial ênfase foi dado ao tema família. Aqui, descrevemos completamente as várias abordagens consideradas nas iterações diferentes a partir das quais o protótipo encapsulou o desenvolvimento de uma estrutura de árvore genealógica, bem como a comparação entre as abordagens consideradas. Como soluções, foram consideradas duas aproximações. A solução *page*, uma estrutura que apresenta os parentes do idoso numa estrutura paginada, em que o utilizador tem de navegar página-a-página para transitar na sua árvore genealógica. Em contraste, foi também apresentada a solução *canvas*, uma estrutura em forma de grafo, que organiza todos os parentes do utilizador idoso à sua volta, permitindo uma maior facilidade de navegação na mesma. Fizemos então sessões de testes de forma a validar as soluções supracitadas. Dos resultados obtidos, concluiu-se que, quando usando uma estrutura que organiza os seus parentes à sua volta, os idosos muitas vezes preferem que a informação de parentesco seja apresentada em relação a eles, em vez de ser apresentada em relação ao parente que estão a ver. Finalmente, nesta fase conseguimos perceber que a interação com a solução *canvas* é bastante mais privilegiada e preferida pelos idosos, uma vez que proporciona uma maior facilidade de interação quando contrastada com a outra abordagem considerada.

Finalmente, na terceira e última fase do nosso trabalho, focámo-nos na avaliação da interação dos idosos tanto com o protótipo baseado no Facebook – que foi desenvolvido na fase anterior do nosso trabalho – e com a aplicação nativa do Facebook. Para este fim, realizámos estudos com utilizadores de modo a perceber, fazendo uso de métricas de usabilidade e acessibilidade, da facilidade de interação dos utilizadores idosos com essas soluções. Como principais conclusões e resultados desta fase conseguimos perceber diversos aspetos relacionados com a adequação do protótipo a utilizadores idosos. Alguns desses aspetos incluem facilitar a interação, potencializando as atividades que permitem aos utilizadores idosos enviar mensagens a um grupo específico de utilizadores. Também fomos capazes de perceber que é importante a inclusão de uma estrutura no protótipo, que forneça aos idosos uma visão mais clara sobre os seus familiares, bem como uma melhor *user experience* ao navegar na sua árvore genealógica. Além disso, temos fortes indícios de que deve haver um apoio suplementar para a promoção dos conteúdos que foram publicados pela família dos utilizadores. Finalmente, foi-nos possível perceber que a aplicação nativa do Facebook não fornece aos utilizadores as opções para convidar um grupo específico de contactos para seus eventos recém-criados. Isto representa um desafio para os idosos, sendo que estes relataram ainda que utilizam principalmente os mecanismos de gestão de eventos, a fim de convidar seus parentes mais próximos para eventos familiares e, assim sendo, sugerimos a inclusão de tal mecanismo.

Palavras-chave: Platformas de Redes Sociais, Idosos, Facebook, Recomendações de deign, Estudos com utilizadores, Tablets

Abstract

Population is becoming older and old age dependency ratios are increasing. The ageing process is usually related with retirement, which in turn brings isolation, which is one of the most concerning issues regarding older adults. This user group often wants to communicate and interact socially and although there is a strong link between ageing and loneliness, this sentiment often characterizes persons who do not communicate with their family and/or immediate friends. The potentialities of touchscreen devices for older adults have been investigated over time in several research applications. The adoption of social networks by older adults has increased in the recent years. However, many still cannot make use of social networks as these are simply not adapted to them.

In this dissertation, we further the understanding about older adults, their limitations, and their preferences when interacting with Facebook, in order to provide recommendations that assist the design of an improved interface for tablet devices. Specifically, this research aims to: (1) investigate older adults' challenges and preferences when interacting with the Native Facebook Mobile Application; (2) perceive how the older adults' preferences when interacting with Facebook's Mobile Application could result in suggestions for its improvement; (3) translate such suggestions to the form of recommendations for the design of a Mobile Social Network that suits the older adults' requirements; (4) use such recommendations to design a Facebook-based prototype that provides an improved interface, focusing the older adults' interaction with the social network; (5) compare the older adults' user experience with both the developed prototype and the Facebook Mobile Application, in order to obtain several usability and accessibility indicators.

From this dissertation we have obtained several results that allowed us to perceive which behaviours are privileged by older adults when interacting with the Facebook Mobile Application, as well as a set of recommendations for the design of a Facebook-based prototype that suits the elderly requirements. From these recommendations we developed a prototype aiming to increase the elderly accessibility levels to Facebook. Lastly, by comparing our approach with the Facebook Mobile Application, we were able to assess its design and conclude that such interface is well suited for the older adults interaction with Facebook.

Keywords: Social Network Platforms, Older Adults, Facebook, Design recommendations, User studies, Tablets

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Chapter 1

Introduction

The ageing process is of extreme concern for some of the most developed countries, and, with it, several issues arise regarding the well-being of an ageing population. With the ageing process, several problems arise, which range from the physical to the social point of view. One of the most concerning issues is social isolation, which has a greater impact typically at the age of retirement. Technology – concretely, mobile technologies and devices – is regarded as a viable way for suppressing this problem. Furthermore, support for creating new ties and regaining the lost ones is often given by Social Networks and the most used and referenced is Facebook. Within this scope, this section presents the motivation for this work, bringing insight to the aforementioned aspects and defining research questions and objectives, that focus our research. Moreover, we justify the contribution of out work, finishing with a description of the document outline.

1.1 Context

A demographic change is happening both in the European Union (EU) and in other industrialized nations. Population is becoming older and as a consequence old age dependency ratios are increasing [41]. Increasing longevity is also shifting the age distribution of populations toward older age groups and after 2010, this shift will accelerate its pace in most industrialized countries, as the "baby boomers" begin turning sixty-five. Some countries – such as Australia, Canada, France, Germany, Japan, New Zealand, the United Kingdom, and the United States – are experiencing the effects of population ageing on several areas, such as health care spending, retirement policies, use of long-term care services, workforce composition, and income [2, 89].

The ageing process is usually related with retirement, which in turn brings solitude and isolation [130]. Past works have shown that these sentiments mostly characterize persons who do not communicate with their family and immediate friends, or whose number of contacts decreased significantly [88]. There is already strong evidence that both frequency and perceived quality of contact affect the health outcomes of isolated older

adults, as stated in [57]. Several and more profound analysis to this issue have shown that social isolation can be a conspicuous feature of having chronic pain [25, 86]. Additional studies in this area have also revealed that chronic pain patients who perceived they had family support reported less pain intensity, more satisfactory social activity, and fewer instances of pain that somehow interfered with their daily living, in contrast with those who perceived their family support was inadequate [32]. Accordingly, several efforts are being made to deal with these issues. One of the approaches consists in the use of Information and Communication Technologies (ICTs) to provide constant assistance to the elderly with the main purpose of allowing them to remain independent, and – if possible – in their own homes for a longer period of time [129]. These technologies have been used in several different contexts, from health care to security, communication and leisure [111].

In this context, new terms have been coined, such as "Gerontechnology", which refers to specific technology that is built in order to meed the needs of an ageing society – such technology considers research, development and design in the engineering disciplines based on scientific knowledge about the ageing process [111]. Moreover, and formally speaking, Gerontechnology is defined as the study of technology that ensures good health, full social participation and independent living throughout the entire life span of the older adult, as long as it may extend [14, 111].

Past works have shown that older adults are frequent users of technologies, which are being designed to support an active life [85], thus assuring viability for the upcoming ideas in the perspective of building supportive mechanisms to improve older adults' usage of such technologies. Nonetheless, many psycho-motor, cognitive and sensory declines naturally unfold with the ageing process, transforming the needs and expectations of senior users different from those of their younger counterparts [76]. Further, society often considers the elderly as being too old to learn how to use new technologies [61], but contrary to that supposition, several authors have found that when the appropriate strategies are put into practice, in fact older adults are not only interested, but also completely capable of learning to use mobile devices [16, 30]. Czaja et al. [30] stated that special design considerations have to be taken into account when designing for the older adult population. However, nowadays most designs are not considering older adults' specific needs and characteristics, by focussing mainly on younger and more technologically aware and proficient user populations.

1.1.1 Tablet Devices

The potentialities of touchscreen devices for older adults have been explored and investigated over time in research applications, which ranged from health information [110] to social networking [82]. Several authors have discussed the potential advantages of touch-based interactions as the ones supported and offered by tablet devices, stating that this

type of devices brings easier interaction for older adults [63, 128]. Their studies have revealed that touch interfaces are generally believed to grant natural and intuitive user experiences, which provides immediate interaction and thus, much more reduced learning curves [33, 118, 144]. Likewise, and more specifically, Joyroe et al. [69] have made a study in order to examine whether older adults' use of tablet devices could provide a more efficient and effective means of accessing information, than laptop computers. As a result, they have concluded that most of the considered challenges that are typically associated with the usage of a tablet device, could be overcome with experience. Moreover, the ability to directly touch and manipulate data on a touchscreen – without having intermediate devices – has a strong appeal, since it provides for a more natural and engaging experience, as stated by Nicolau et al. in [104].

Summarizing, touchscreens give great flexibility, which makes it possible to display different interfaces on the same surface or event to adapt to the users' current needs and preferences [50], making touch-based devices a good support for elderly interaction with technologies.

1.1.2 Social Networks

As technology advances and the proliferation of communication services arises, new needs for creating social ties emerge, and opportunities for rediscovering the lost ones become available for users. Social Networks Services (SNS) are a particular set of social media supportive services, that mainly focus on providing viable ways of connecting users with each other [18]. These services have also lead to several forms of community building, with users interacting with one another using social communities, also known as Social Network Platforms (SNPs) [5, 114]. The biggest example of this kind of communities is Facebook, where social interactions [143] usually comprehend a wide range of behaviours, such as messaging, creating and commenting on events and all sort of communication and interaction mechanisms usage [84].

Studies predicted there would be a massive 1.43 billion social network users in 2012, representing a 19.2 percent increase over 2011 numbers [4], which in turn has been verified with precision. In this context, social networks are getting even more popular with the growing population, especially older adults. Recent studies also show that the usage of platforms like Facebook, by allowing frequent, light and collective discussions with close family [88, 115], increase well-being and life satisfaction [130], and reduce isolation [17]. For these reasons, the adoption of social networks by older adults has raised considerably in the recent years [90]. Thus, these services seem to provide a good support for ties and relationships, as has been shown with the passage of time.

Even though several studies have presented ways of supporting elderly interaction and communication, still many of nowadays services represent a challenge for senior users, as they are not simply designed for them, having a straight focus on the remaining set of

the population. Thus, we have found pertinent to investigate ways of implementing an interface that provides a better user experience and support for elderly interaction.

1.2 Motivation

The percentage of seniors in industrialized countries has never been so high and shows a natural tendency to keep increasing. In 2001, The Department of Economic and Social Affairs - Population Division (United Nations) made a report that provided a description of global trends in population ageing and included a series of indicators of the ageing process by development regions, major areas, regions and countries. In the report it was shown that population ageing is unprecedented, pervasive and enduring, having profound implications for many facets of human life [102]. Many datasets indicate that the average percentage of older people – which is usually defined as over 65 years of age – in 2010 was 16% in the European Union [45]. Moreover, it has been predicted that by 2030-2035 the percentage of older adults of the total population is estimated to be around 23.8% in the European Union [46].

This reality is also reflected in countries like Portugal, in which the ageing population is a fundamental factor to consider. In 2010, seniors over 65 years of age were representative of about 18% of the Portuguese population, and studies reveal that by 2030 this number is expected to increase to 24.2% [29], which as has been already shown, represents a value that is slightly higher than the average for the European Union.

Moreover, when looking at the *old-age dependency ratio* – which refers to the number of older dependent persons as a percentage of the *working-age population* (defined as persons between the ages of 15 and 64) – one finds for the European Union that this ratio was 25.92% in 2010 and is estimated to increase to 38.33% by the year 2030, and to 50.16% by 2050. Further, this value amounted to 26.7% in 2010 and is expected to reach 37.85% by 2030 and 55.62% in Portugal, as stated in [29].

Several issues contribute to the ageing trend found in the European Union and other industrialized countries. Low fertility rates and the increasing life-expectancy constitute the two most immediate slants of this topic and represent the direct consequence of several social and economical changes [28]. ***Low Fertility Rates*** can be easily explained by, as stated in [28], the increasing "difficulties in finding a job, the lack and cost of housing, the older age of parents at the birth of their first child, different study, working life and family decisions". On the other hand, ***Extended Life-expectancy*** is merely a result of the continuing improvement of health care and quality of life in the European Union.

All these factors contribute to an increasing *old-age dependency ratio*, as was previously shown, which can pose several serious economic, budgetary and social challenges in the future. This is also supported by the fact that an increasingly aged population requires an ever-growing amount of financial resources, and thus the steady increase of

older adults and decrease of the working-age population poses serious threats to the social support and health care systems within the Europe Union, as past studies have revealed [125]. Furthermore, an assorted number of references to past works about the elderly problems with social isolation raise increasing issues. In fact, several authors state that this is a serious problem for the ageing population [69, 130], inferring that it could even lead to drastic health degrading situations. Other authors have managed to investigate that the family contact can be a prominent factor regarding an older adult's health condition, as it has been shown that seniors who feel closer to their family, often present a better health condition than the ones who do not [32]. Withal, many past studies have unveiled the constant necessity of the elderly population to be in contact with their closest family members [115], and as a result have concluded that seniors privilege an environment in which they can communicate and easily interact with their closest relatives.

Social networks are a good solution for the aforementioned problem since they allow the involvement of users in many social activities, also providing the users with several online communication mechanisms [147]. Moreover, past works have also revealed that older adults often feel the necessity of a stable atmosphere in which they can not only strengthen existing strong relationships and rediscover the weak ones, but also have the feeling that they are close to their family members [115]. Although SNPs provide the support for social activities, they are not focused on family-based features and do not allow the users to perform family-directed behaviours, which, as has been stated in previous works [88, 115], is the main necessity of older adults that suffer from several isolation and loneliness problems [130]. Despite this fact, although elderly users have much more affinity for interacting with touch-based interfaces – such as tablets – than with other traditional interfaces [49, 53, 104], often those users feel that interaction with the SNPs within the same touch-based surfaces represents a challenge for them, mainly due to the fact that the interface is not simplified enough for them to interact and perform the desired behaviours.

Attempts could be made in order to design a new social network platform that would consider interaction with family-based features and had family focus as its core asset, trying to achieve the best interaction experience among the senior population. Even so, that approach would have two major problems: (1) the challenge of attracting the masses to a newly created community service and (2) the lack of acceptance from non-senior users, due to the fact that the social network would be mainly focussed on senior users and probably not as interesting for the other user set. Within that set, family is a particular case and as shown in [92], family is a fundamental factor when considering the senior population. Thus, the problem with connecting these older adults with their family would still remain. Those barriers must be broken by designing solutions which consider specific age related conditions from the start, and enable seniors to take advantage of new technologies and services that can help improve their quality of life.

1.3 Research Focus

The aim of our work will be to find ways of suppressing these problems by first investigating how the elderly population uses new technologies and concretely the Facebook SNS. The decision to focus on this SNS is mainly justified by the fact that it is the most used worldwide, and thus has a major adherence by users in general. By doing this, we intend to characterize their usage of those services, as well as indications of which are the major challenges that elderly users find in the Native Facebook Mobile Application, so that we can obtain several suggestions that could guide us throughout the development of a prototype, based on such suggestions.

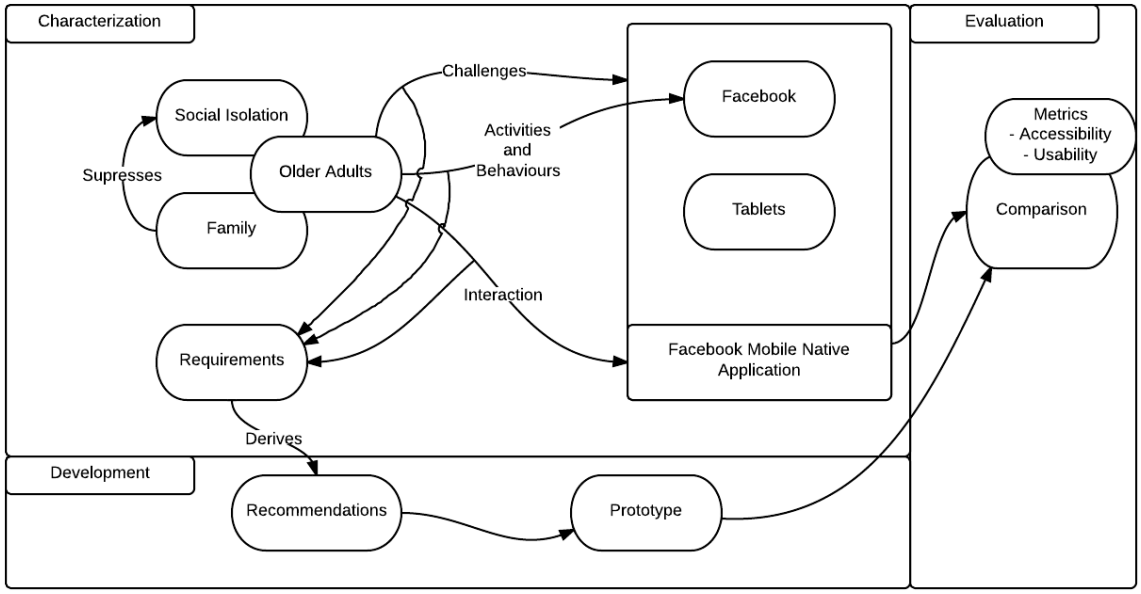

Figure 1.1: The conceptual framework representing the research scope

Figure 1.1 shows the conceptual framework that illustrates the focus of our research, which will be mainly focused on the older adults. In the first phase of our work – and after our literature revision –, we are able to perceive that family is the main motivator to suppress the elderly social isolation problem. Accordingly, in this phase we believe that it would be interesting to characterize the older adults' activities and behaviours when interacting with Facebook, as well as main challenges when interacting with the Mobile Facebook Application. Naturally, we aim to understand the older adults' requirements, regarding the aforementioned issues, and such requirements will essentially be mapped into recommendations for the design of a Mobile SNS. Thus, we consider that the opportunity to develop a Facebook-based prototype will emerge, resorting to the design recommendations that we seek to obtain. Finally, we will focus on the comparison of the Native Mobile Facebook Application with our prototype. Such comparison will be made with older adults using both approaches, and having into account two metrics: accessibility and usability.

1.4 Research Questions and Objectives

In order to investigate the aforementioned issues regarding elderly contact with family-based Facebook features, we intend to answer the following research questions (RQ):

- **RQ1**: What are the main activities an Elderly user wants to perform in Mobile SNS?

  Objective: Find out which activities and behaviours the Elderly users are most likely to perform within a Mobile Social Network.

- **RQ2**: What are the main challenges of Elderly users when interacting with Mobile SNS?

  Objective: Discover which are the main challenges of the Elderly users when faced with a complex interface such as the one presented in a Mobile Social Network.

- **RQ3**: What are the main requirements for an SNS mobile interface targeting older adults?

  Objective: Bring insight into what are the main requirements a Mobile Social Network has regarding the older adults' interaction with it. Disclose the set of design recommendations that could be derived from Elderlies' interaction with Mobile Social Networks in order to improve them to better meet the Elderly users requirements.

- **RQ4**: How can the older adult accessibility recommendations be designed into a Mobile SNS?

  Objective: Apply the obtained design recommendations in order to build a Facebook-based prototype, regarding the improvement of the elderly usability and accessibility.

- **RQ5**: Can an interface built following the older adult accessibility recommendations be more attractive for older adult users than the actual Native Facebook Mobile interface?

  Objective: Compare the prototype built in the last phase of the research, with the Native Facebook Mobile Application, using usability and accessibility metrics, in order to assess the improvements resulting from applying the previous recommendations.

1.5 Thesis Contribution

The research performed in the context of this thesis aims to provide a set of contributions. Concretely, in the **first phase** of the research, we aim to better understand the activities

that older adults want to perform the most, when interacting with Mobile SNS, along with an insight into the main challenges that older adults have when interacting within the same scope. Lastly, from this phase we aim to unveil a set of recommendations that could be successfully used for the design of a Mobile SNS, that focuses the older adults' needs and expectations. Additionally, the **second phase** of this research contributes to the knowledge about how can the recommendations for the design of an interface that better suits the elderly requirements, be translated into the detailed design of a Facebook-based Mobile interface. Such interface will be implemented over a Tablet device, running an Android operating system. Finally, research **phase three** provides a comparison between the Facebook-based prototype, and the Native Facebook Mobile Application, regarding the older adults' ease of interaction. By allowing participants – which are older adults – to perform tasks that are representative of actions they would like to perform in real life, this comparison also helps to further understand how easily this set of user-population can interact with an application that suits their requirements and the behaviours that they value the most.

Summarising, our contributions with this work are as follows:

- A set of recommendations for the design of a Mobile SNS that suits the older adults' requirements when interacting with SNS.
- A Facebook-based prototype, designed resorting to the recommendations that were derived from the older adults' requirements when interacting with SNS.
- The results of assessing the interaction of older adults' with the Facebook-based prototype, in comparison with their interaction with the Facebook Mobile Application, resorting to usability and accessibility metrics.

Lastly, our work within the scope of this thesis also originated several research publications. Two of those were made when the first phase of our work was being performed (one more paper is submitted for publication, regarding this research), whereas the other was made in the last phase of our work:

- Gomes, G., Matos, E., Coelho, J., Duarte, C., *Family Tree: Motivator for Elderly Adoption of Social Networks*, CHI 2013 Mobile Accessibility Workshop, April 27 – May 2, 2013.
- Gomes, G., Coelho, J., Matos, E., Duarte, C, *Estudo de uma nova Interface para o Facebook centrada em utilizadores idosos*, Submitted for publication at INTERAÇÃO '13, 2013.
- Coelho, J., Gomes, G., Matos, E., Duarte, C, *A Survey About Media Content Consumption in Social Network Platforms*, Submitted for publication at INTERAÇÃO '13, 2013.

1.6 Document Outline

This thesis is structured in seven chapters, to which we will now refer summarizing each chapter's content.

- **Chapter One – Introduction**

  Chapter one provides the reader with background information regarding the importance of considering the ageing process and several factors inherent to it as conditioners for the elderly adoption of social networks. In addition, the specific focus of the research is discussed, as well as the main contributions that are obtained from the research, and the overall research questions and objectives.

- **Chapter Two – Older Adults**

  Chapter two starts by presenting demographic facts regarding the ageing population. Further, it discusses the issues related to this social change, as well as an overview of the current Information and Communication Technology solutions, specially considering mobile devices. The chapter then provides an overview of a range of age-related changes and their potential impact on the design of user interfaces for the elderly user population, particularly considering the social isolation problem. Moreover, we discuss the importance of the family for the older adult and how social networks can work as a social motivator and bring the older adults' the feeling of proximity to their family. Finally, focussing on the most used SNS – Facebook – we shed light into several aspects inherent to it that require improvement in order to meet the older adults' requirements.

- **Chapter Three – Methodology**

  Chapter three discusses and justifies the research strategies and data collection techniques that were adopted in the three posterior phases of our work. It reintroduces the research questions and objectives in order to bring insight into the main goals that we intended to meet, and then presents the methods used in each of those phases, as well as the techniques which were employed for the data collection and consequent analysis. Additionally, this chapter provides an overview of how each one of our work's three phases is connected to the others in a sequential manner. In order to do so, in this chapter we show how each phase derives from and builds upon the results from the previous one.

- **Chapter Four – Understanding Older Adults' Usage of Facebook**

  Chapter four describes the first phase of our work and starts by characterizing the older adults' usage of Facebook. To do so, we describe the several user studies that were made, characterizing scenarios, participants and tasks. Further, in this chapter

we shed light into the several participants' suggestions that have resulted from the user studies. Finally, we categorize each one of the participants' suggestions within a specific topic or group, in order to provide the reader with a comprehensive insight to all the topics.

- **Chapter Five – The Facebook-based Prototype**

  This chapter describes the second phase within which our work was developed, and starts by describing how we considered the results from the previous phase – the obtained recommendations for the design of a SNS – in order to develop a Facebook-based prototype focussing those recommendations, giving special relevance to the family factor. Furthermore, this phase describes the several iterations that were considered to build the family structure, with special insight on the implications that each one of the solutions had.

- **Chapter Six – User Studies**

  The sixth chapter of this dissertation describes the user studies that were made in order to understand usability and accessibility aspects regarding the participants' interaction with the Facebook-based prototype and the Native Facebook Mobile Application. Moreover, we compare the tasks that the users perform in both applications, by making a qualitative analysis.

- **Chapter Seven – Conclusions**

  The last chapter mainly discusses the results that were obtained from the previous research phases. It then reflects on methods that were used in each phase of the research, as well as potential improvements to these methods. Moreover, this chapter reintroduces the aim of this research, as well as all the research questions and objectives. Lastly, it then summarises our main findings, and conclusions according to each one of the research questions. Finally, this chapter brings insight into the contributions of our research, and proposes a set of hypothetical directions for future work.

1.7 Summary

This introductory chapter has provided the reader with sufficient background information regarding the importance of considering the ageing process in the world these days. Several age-related issues were also taken into account when discussing the ageing process concern, as these issues were considered as ranging from physical to social problems. The most discussed topic was the latter one, with special relevance to social isolation. In addition, reference is made to ICT as the main course for the suppression of elderly isolation, by using tablet devices as the supportive technology of election. Moreover, there

was also a straight allusion to the social networking benefits provided by SNS, as this services are considered the most used for providing communication and improvement of ties and relationships between the elderly users and their closest contacts.

Furthermore, this chapter has also discussed the focus of our work, presenting every aspect inherent to it, providing the reader with a clear perception of our motivation with this research. Finally, there was also a description of each and every research question and objective that has been sketched within the scope of this work, as well as a full explanation of the main contributions that emerge from our research.

Chapter 2

Older Adults

This chapter presents aspects relating to the ageing population, concretely age-related changes to the several cognitive and psychological aspects, as well as social alterations associated with later life. Considering the latter aspect, we manage to investigate and detail the most concerning issue regarding older adults, social isolation. We then investigate the importance of the family as the main motivator for the improvement of social communication among the elderly population. Lastly, we discuss an overview of older adults and their attitudes and habits towards ICTs, as the main facilitator for their interaction with Social Network Services (SNS). By providing this background, we hope to situate the reader into the scope of our research and shed light into several important works that have been done, discussing some of their pros and cons, regarding what we have proposed to achieve.

2.1 Age-related Changes

The design of human-computer interfaces has been focussed on the development for younger persons over the past years [56] and therefore there was the incremental risk of excluding specific user-groups, such as the older adults, whose needs and requirements differ largely from those of their younger counterparts [30, 76, 149]. Accordingly, most research and development in the field of communication and information technology to support older people with disabilities has mainly concentrated on the development of special systems, and on accessibility features focused on younger disabled people [123, 127]. The knowledge from these fields, therefore, does not necessarily apply to the challenges encompassed in the functionality, which is ever changing and naturally accompanies the ageing process [8, 64]. Thus, in order to successfully design interfaces that are adequate for older adults, a perception about several age-related changes that are likely to occur to the human sensory, motor and cognitive systems, along with the psychological and social alterations that also unfold with the ageing process must be promoted.

2.1.1 Physical Alterations

The first and one of the most affecting physical changes in older adults is very likely to occur with ***vision***. All individuals will eventually experience some kind of visual impairment, which can vary in degree from person to person, as explained by Pak et al. in their work [108]. In addition, these impairments can be exacerbated by diseases such as **cataracts**, **glaucoma** [131] and **diabetic retinopathy** [67]. When designing interfaces for devices with prominent displays, understanding age-related changes to the visual system is of great importance, since most of the information is conveyed visually [108], and even tough there are already some devices that make use of haptic feedback, most of the aforementioned devices and applications basically rely on the display of a visual interface.

Further, **visual acuity** also suffers with age-related declines. Acuity represents the degree to which a person is able to see the details in visual images [22, 108]. There are several changes to the physiological system that can affect the eye and provoke losses in visual acuity. Several studies show that with the ageing process, there is a natural steady decline in acuity for a large number of people [108]. This loss in visual acuity may start affecting a person by the age of 20 years old, and then quickly decline after reaching the 60 years of age [22], therefore user interfaces with small text, small icons and other visual elements that are represented in a small scale should be avoided as they can significantly hinder the older adults' ability to interact with an interface [131]. Additionally, **colour perception** is significantly altered by age. The gradual yellowing of the eye lens and the reduced sensitivity of the short wavelength cones makes distinguishing between colours with similar hues and low contrast harder for older adults. Therefore and according to Shari et al. [131] and their past research, when designing user interfaces, highly saturated and contrasting colours are recommended.

Next, there are other several age-related diseases such as **cataracts**, which is mainly characterized by the process of clouding or loss of transparency of the eye lens. This effect limits the light rays from entering the eye, which provokes issues, such as decreased contrast and colour perception [117]. Another issue that affects vision is **glaucoma**, which in fact refers to a group of diseases that damage the optical nerve and can possibly cause blindness. Although glaucoma is not an age-related disease, its manifestations typically increase after the age of 60 [131]. It is important to notice that the most common consequence of having glaucoma is the increasingly reduced peripheral vision, which can hinder a person's ability to drive, walk, avoid obstacles and all other activities that involve the use of this particular visual function [67]. Despite that fact, glaucoma can also affect motion and – such as cataracts – colour perception, contrast sensitivity and central vision acuity. Lastly, studies show that **diabetic retinopathy** can also result in the loss of visual acuity, peripheral vision, contrast sensitivity and colour perception [67].

The second most affecting and widespread issue among older adults is ***hearing loss*** which may be an important factor in reducing the quality of life of an individual [22, 31].

Considering that we mainly communicate with each other using verbal communication, loss of hearing may balk the individual's ability to understand and actively participate in a conversation, as well as in many other social activities that require communication. In a worst-case scenario, hearing loss can even result in the withdrawal from society, when the individual ceases to communicate with his or her family and friends, mainly due to the challenges imposed by non-verbal communication [117]. Increasingly, and together with the other cumulative age-related diseases, loss of hearing can result in loss of independence, **social isolation**, irritation, paranoia, and **depression** among older adults [22].

2.1.2 Cognitive Alterations

The second age-related issue we intend to discuss is ***cognition***. Cognition is of extreme relevance when considering interface design, as in many cases a user interface can be appropriately designed for the users' visual, motor and auditory capabilities, but may not be understandable. Thus, cognition is a factor that may render a product that is adequately designed for younger adults, to be unusable by their older counterparts. This is essentially supported by older adults' increased difficulties in developing adequate mental models, which tends to increase with the ageing process [113]. This becomes an alarming concern if we consider that mental models are particularly relevant to User Interface (UI) design, concretely cognition-related abilities such as **memory** and **attention**.

Even if subjectively and unconsciously, one of the individual's major concerns while performing a task is **memory**. Working memory is a specific type of memory, which reflects the ability of an individual to store information while performing a task. This type of memory is different from short-term memory, mainly because it does not just involve remembering items for a short period of time, but also remembering them while carrying out any related or non-related task [51, 108]. For these reasons, declines in working memory can have a drastic impact in several daily activities such as speech and language comprehension [22] and reasoning and problem solving [51]. In order to compensate for these declines in working memory, Pak et al. [108] have suggested an interface that adapts to the task that is being performed by the older adult. The process was based on providing all the information that is relative to that one particular task, while it is being performed by the user. Such interface avoids making use of working memory by displaying all the required information, freeing the user from the burden of having to remember it [108].

Despite this, a user's performance while carrying out a task is not simply defined by his or her capacity of memorizing information, but also by the way he or she concentrates and processes information, which is denominated as **attention** [51]. Attention is considered a limited resource and is particularly relevant when considering multitasking, where the attention and its resources need to be partitioned and divided across various tasks [22, 51]. Pak et al. [108] have made focused research on this area and suggested

to avoid clutter and remove superfluous information, when designing interfaces for older adults. They have also inferred that it is important to draw attention to important items or frequently performed actions, since it might be a form of avoiding intentional selectivity (ability to focus on one factor while ignoring the others) and vigilance (ability to focus on one task while ignoring the others) among older adults.

2.1.3 Social Alterations

As has been discussed until now, carrying out several activities of daily living can become increasingly challenging with the ageing process, due to many physical and cognitive changes, as stated in [81, 101, 116]. While affecting these systems, these changes can also hinder the older adults' ability to participate in social interactions, to live independently and safely [10]. In addition, these changes can eventually also result in alterations in the way older adults perceive themselves and their social roles within the whole society [52]. However it has been found that maintaining social relationships could somewhat avoid age-related cognitive declines and dementia [9, 21], so they should be fostered.

Unfortunately, a common risk that usually comes with the ageing process is **social isolation**. Social isolation and loneliness are often associated with older age and have both been identified as risk factors for a number of health related problems. Past studies have shown that regardless of their living circumstances, it is clearly important that older people have access to their social connections [57]. Specific research on the area shown that *social isolation* is usually related with an objective state, where an individual has minimal contact with others and therefore has a low level of involvement on the community life [120, 139]. On the other hand, *loneliness* is generally accepted as being a more subjective experience as it relates to a person's perception of their social relationships or level of social engagement, as being deficient in some way – either in terms of quantity or quality [135, 140]. Nevertheless, past studies have suggested that the negative impacts of social isolation are stronger for senior citizens who have retired from work and therefore abruptly lost much of their daily interaction and social communication, as stated by Sundar in [130].

2.2 The Importance of the family

As we have already seen in the previous chapter, adults of the baby boom generation have begun to reach the age of retirement and in part because of resource concerns, several initiatives have been launched to help these adults *age in place* [130]. But as we have also demonstrated, this is not the only concern when regarding this user-population's needs, since most of them do want to communicate and interact socially. To support this, there are indications from past research that prove that although there is a strong link between ageing and loneliness, this sentiment often characterizes persons who do not communicate

with their family and/or immediate friends [88], which are known to be the closest social groups regarding the older adults [126]. With this statements well corroborated, there is good support for us to consider that family is a great priority for the older adults. This averment is essentially supported by the fact that family is avowed to suppress the feelings of social isolation and loneliness, among the elderly population [119, 121].

Moreover, there is strong evidence that both frequency and heeded quality of social contact affect the health outcomes of isolated older adults, as stated before and in [57], and as show in previous studies, chronic pain patients who perceived they had family support, reported less pain intensity, more satisfactory social activity and fewer instances of pain interfering with their daily activities. This contrasts with those who perceived that their family support was inadequate, who have felt much more pain daily, besides the fact that the feeling of pain was increasingly growing day-by-day [68]. This obviously suggests that there is a predominant role for communications technologies to play in better affording for the support of older adults with chronic pain, since improved communication methods could potentially improve the health status of these individuals. Thus, it is of utmost urgency that the focus of ICTs directs many of its research efforts to family-related functionalities.

Despite these facts, over the past few years and as an approach to solving the aforementioned discussed issues, increasing efforts have been made in order to provide solutions for ***Ambient Assisted Living*** (AAL). AAL aims at extending the time older people can live within their home environment, managing to increase their autonomy and assisting them in carrying out activities of their daily routine. In order to achieve that goal, AAL makes use of intelligent products and mechanisms, as well as the provision of remote services, such as care services [129]. Research proved that remote clinical therapy at home will not bring a negative effect to the therapy process [37]. Accordingly, integrating these systems into older adults' daily routines could result in a large reduction of government costs, since it would support the independence of older adults, allowing them to live in their own houses (contrastingly with living in nursing homes), while reducing the need for caretakers, personal nurses or institutionalization in retirement homes [129]. Further, there are strong indications given by several research activities that older adults prefer to remain in their own homes as long as possible, mainly due to reasons such as staying in a familiar environment [100, 137], and much closer to their family [130]. However, since AAL systems are thought to be effective and become widespread, efforts need to be made in order to obtain the appropriate design of these systems, regarding older adults' specific needs, expectations and characteristics as stated by Steg et al. in [125].

2.3 Technology and Mobile Devices

It is estimated that about 74.4% of Europe's population are Internet users [65]. This number is considerably lower when it comes to the worldwide extent, with about 34.7% estimated Internet users [65]. Moreover, while Internet usage is not so commonly spread worldwide, the use of mobile devices is very considerable in both developed and developing countries. Considering the ageing course within the developed countries [111] it becomes clear that as well as living longer and more active lives, older adults' needs are increasingly changing [42]. Their need to use new technological devices is of ascendant importance to an inclusive society, and this becomes an even more serious issue if we consider the ICT gap between younger and older generations [111, 149]. Still the design and development of such devices and technologies has not yet taken into account the older adults' specific needs and expectations [30, 76, 56, 149].

In addition to this, there are several barriers that limit the consequent bridging between older adults and new technology. Often, **anxiety** [133] and low **confidence** [30] have been recognized by past studies as one of those barriers. But although these issues constitute peremptory barriers to the use of technology by older adults, other research has shown that they can be overcome by designing products that better meet the elderly needs and expectations, contradicting that tendency. This can be achieved by teaching this user-population how to use these new devices [16] and providing several environments in which the older adults can better interact with ICTs, thus providing a positive experience within that context [30, 149]. These facts are justified by studies which have shown that when older adults can understand the benefits of the adoption of a determined technology, their receptiveness and general attitude regarding that technology is considerably improved [16].

Mobile devices have also received an increasing amount of attention as platforms for developing specialized applications regarding the needs of the elderly population [24, 72, 87]. Such applications have mainly been dedicated to chronic disease management, medication, safety monitoring, access to health information and wellness. With recent modifications in healthcare systems in several countries, and an increasing ***old-age-dependency-ratio*** [45], there are strong indications showing that services like the aforementioned ones will be most beneficial. This is essentially due to the fact that they allow older adults to maintain social relationships and monitor their health, while maintaining independence by continuing to live in their own homes [111].

Given that many seniors wish to remain independent in their homes and live by their own, there has been a particular focus on technologies that target the support of what is known as "ageing in place" [12, 93, 101]. Marek et al. [93] have introduced that concept, which allows the senior population to remain in a comfortable home environment, normally while receiving care and monitoring from other persons living outside the home. These systems can often be as advanced as "smart homes" instrumented with sensors and

cameras [35], but with the particularity of allowing doctors, caregivers or even **family members** to monitor seniors' activities and check for evidence of potentially existing or appearing problems [12, 97].

But while Ageing in Place allows seniors to maintain a sense of independence and simultaneously remain in a familiar environment – and even though they are both often desirable – there is a more specific need, which relates to their interaction with others [34]. After all, communication is essential and serves as a foundation for social relationships, as stated by Duck in his research [40]. Thus, allowing and providing communication can be the way for avoiding the sense of isolation and loneliness that was already identified as one of the main issues of this research.

2.4 Social Networks

The continuous proliferation of Internet technologies facilitates the growth of cyber communities, where individuals with common interests can communicate synchronously or asynchronously through various means. These have lead to several forms of community building, with users interacting with one another using social communities, also known as Social Network Platforms (SNPs) [5, 106]. The biggest example of this kind of communities is Facebook, where social interactions [142] usually comprehend a wide range of behaviours, such as messaging, creating and commenting on events, or even sharing contents [54, 84]. Social networks exist that target specific groups of users, organized around different interests or activities, although the most known and used are those that can be considered generalist. These networks need to cater for audiences that have a great range of abilities and computer literacy.

Seniors increasingly feel the need to have contact with new technologies, and such technologies are being mainly designed to support an active life [85]. As stated in [73], older adults have a natural appetite for creating personal projects. In their work, Kankainen et al. [73] wanted to pay attention to how interactive media is able to support engagement in creative personal projects of older users. In summary, their conclusions pointed that some of those projects were actually reflective on one's life: collecting, choosing, recommending, and sharing media content, as well as organizing social events were the aspects of creative personal projects in which they identified interactive media technology as playing a significantly important role [73]. Recent studies also show that the usage of platforms like Facebook, by allowing frequent, light and collective discussions with close family [88, 115], increase well-being and life satisfaction [130], and reduce isolation [17]. For these reasons, the adoption of social networks by older adults has raised considerably in the recent years [90]. However many still cannot make use of social networks as these are simply not designed for them [130].

2.4.1 Facebook

As of June 2012, Facebook claims 955 million user accounts active monthly, having an average of 552 million users active daily [48]. These users are constantly generating contents, interacting and consuming contents within the SNP. A significant amount of research has explored the use of Facebook, examining the role it plays in its users social lives [6]. An efficient way of understanding the Facebook Social Network is by exploring motives for using the service via theoretical frameworks such as *Uses & Gratification* [70]. A good understanding of these motives can shed light into the elaborated mechanisms that are behind the important aspects of SNS, such as **participation** [78], **information seeking** [79], and **user privacy** [70]. These are some of the users' nowadays main concerns when proceeding to invest in a huge SNP like Facebook.

Facebook serve numerous features and functions in offline life – the life that users have beyond the virtual social networking, that is the users' 'real' social life –, for instance providing social and emotional support, information resources and ties to other people [141]. This is supported by several similar kinds of social networks that have been identified in online communities as ways of providing their users with both emotional support, and information resources [141]. Despite this, in both cases it has been shown that an online social network may provide users with **social capital** [43]. James Coleman introduced the concept of social capital in 1988, within his research [27] as "not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors – whether persons or corporate actors – within the structure". Moreover, like other forms of capital, social capital makes it possible to achieve certain ends that in its absence would not be possible [27]. Lastly, unlike other forms of capital – which is mainly characterized by the possession of privileged access to a determined set of resources –, social capital consists of relations between actors and among actors, for it is important that this concept is promoted in social networks, as stated in previous research [44, 134].

Nonetheless, Facebook often maintains a straight focus on users that are characterized with needs and expectations that are comprehended within the scope of the typical user-population. In addition to this, the elderly population distinguishes from the other user-population by having several different concerns regarding these SNS.

The Importance of Groups

In our daily basis, we (most of the times unconsciously) group persons with whom we most interact, either by the way we interact with them or the frequency with which we deal with them [66]. Guerreiro et al. [59] conducted a study that aimed at finding and comparing the most relevant attributes when enquiring about people with different intimacy levels (friend, acquaintance and famous). By asking participants to describe people and rate the relevance of a set of attributes for a person search scenario, they obtained a

combination that for different relationship types, allowed them to perceive the attributes used when describing someone and the ones found relevant when seeking person related information. Their posterior comparative analysis demonstrated that the type of data considered relevant depended on the relation maintained with that particular person [59].

Thus, since users interact with each other depending on their relationship, there is an increasing need for grouped communication for every user [20]. Since SNS already provide several communication mechanisms to its user-population, one may imagine that there would be considerable advantage in providing *grouped communication mechanisms*. This way, the users would be able to not only communicate with each other, but also consume contents from their desired contacts. Many other SNS have all groups labelled and constant without allowing their user-population to define which groups they are willing to create, in order to better suit their needs and expectations [71].

But even so, as Camara et al. stated in [20], until recently, SNS have somehow ignored the existing diversity of social ties, since all of the network nodes were mixed in a single encompassing group and referred to as "friends" or "contacts". Recent studies have highlighted contact segmentation as essential in SNS. Moreover, Binder et al. [11] stated the problem of conflicting social spheres as an immediate consequence of the lack of compartmentalization in SNS, which was then grounded by Jones and O'neill [71], who demonstrated the feasibility of segmenting Facebook contacts into several groups of information sharing. But with the growing number of SNPs users, arises the necessity of providing some contact management strategies. Facebook, for instance, provides filtered access to all the information that is related with a specific list within the user's social graph, through intelligent lists [20] – Friend Lists (FL) automatically created and pre-filled based on users and their contacts profiles information. Other well-known SNPs – Google+ and Twitter – have their features to provide support for group of members of a user's social network. Google+ uses group circles in order to group contacts within the users' rationale. Twitter has also support for list grouping, this being one of the most used features of this SNP [75, 145]. Summing up, mechanisms to specify with whom we share our information allowed sharing content with appropriate audiences within different areas [107], even though many users end up sharing with all their contacts, which is justified by the fact that they do not find current grouping mechanisms intuitive and usable [59, 74].

It is worth noting that, in the specific case of Facebook, the integrated contact management features are not so used as one would expect [20]. Beyond numbers, this statement was mainly justified by Mark Zuckerberg, who admitted that "nobody wants to make lists" [150]. This suggested that Facebook users do not want to filter the contents they mostly want to consume. A very recent report has revealed that people is leaving the Facebook SNP. In his report and recurring to the latest Pew Internet & American Life Project's work, Taylor [124] demonstrated that even though 94 percent of teenage social media users still have Facebook, more and more are jumping ship to Twitter, mostly due

of what Pew found as "increasing adult presence, people sharing excessively, and stressful *drama*" on Facebook SNP. These statements were also quantitatively supported in the report, which states that "Twitter use increased from 16 percent in 2011 to 24 percent in 2012, while Facebook usage stayed consistent, increasing ever-so-slightly from 93 percent to 94 percent in 2012" [124]. Lastly, one of the interviewees stated "Yeah, that is why we go on Twitter [instead of Facebook]. My mom does not have that." This does not necessarily affirm that teens are leaving Facebook altogether, but rather that their interest in the network is waning and it is considered almost a burden to have a presence on Facebook. On the other hand, this study mainly suggests that these users require some sort of mechanism to filter the content that they post and/or want to see, from whom they want. Once more, this sustains our aforementioned inferences about the increasing need for information grouping mechanisms.

Media Consumption

People already spend a bigger amount of time consuming media content over the internet, than the amount of time spent consuming some traditional media, like television [3]. Content sharing is considered to be a great asset for many users who like to create photo books [112], or do video clustering and tagging over a social network [146], so that they can show their experience and special events to friends and family.

Several ways for presenting the media content have been studied in order to be made available in the most popular Social Network Platforms (SNPs). One example of the significance of this trend is that Facebook became a major portal for users to share YouTube videos since it made that possibility available in 2007 [83]. Latest statistics released by Unruly Media [77] reveal that a considerable percentage (about 40%) of YouTube video views, occur via Facebook and that the total number of videos shared among Facebook users has also risen to 58,6 million as of January 2011 [77, 83]. Nowadays, Facebook has already a great support for media content sharing over the social platform itself, providing useful access for anyone that is somehow related to the source user, and wants to interact with that content or simply see information about it.

Recent statistics suggest that online social network (OSN) users regularly share video contents from video sharing sites (VSSes), and a significant amount of views of VSSes are indeed from OSN users nowadays. The interaction between VSSes and OSNs through video link sharing provides new implications in business opportunities. The VSSes can boost their daily video views by a large margin through OSN shares; on the other hand, the OSNs readily offer a video service with no extra cost [83], thus preparing a supportive environment for the consumption of this type of media content.

However, to better support the media consumption activity for users, there is an intrinsic need for the leverage of media search mechanisms within the SNS. Still, current search capabilities are extremely limited and several users are becoming frustrated by their in-

ability to find exactly the type of media content they are searching for [3]. The problem is simply that there is too much content from several sources, and most of this content is not well-categorized, making it impossible to find the desired matter.

Privacy

Another concerning topic regarding the Facebook SNP is the privacy issue. Several studies have been made in order to discover which are the main concerns about privacy that startle SNP users. A subject that typically comes up when referring privacy concerns in SNS, is the **identity privacy**. Facebook users are constantly generating contents that may not only disclose their own information, but also reveal the identities of their friends. This is commonly done by performing actions such as tagging a friend in a status update or photo, or place check-in, etc [122]. Such highly interactive behaviours of interpersonal communication and data exchange makes us think of privacy as an essential matter. This is mostly due to the fact that the user's identity can be very easily exposed by several contents that are generated or tagged by his or her friends, and the other way around.

Gross and Acquisti [58] first highlighted risks such as stalking, identity theft, price discrimination or even blackmailing. Additionally, in his research, Gross has stated that a simple exposure of date and place of birth of a profile in Facebook can be hypothetically used to predict private information of a citizen in the U.S. [58]. Sometimes, by simply revealing their friends list, users might be revealing much more. For example, through the use of prediction algorithms it is possible to infer private information that was previously undisclosed [62, 99, 148]. Photo albums are contents that may also contain several sensitive information about the user, such as places she usually goes to, whether or not she is on vacation and who are some of her closest friends and **family members**. Thus, users' personal information could be easily leaked through information that is shared by their friends' cross-referencing actions on SNS [109].

Additionally, it has been shown by past research that without assuring user privacy, some behaviours of the users themselves can have negative impacts [138]. Several examples can be considered: in 2010, a *pierogi* mascot for the Pittsburgh Pirates was fired due to the fact that he posted some defamatory comments about the team on his Facebook page [15]; more recently, a high school teacher was forced to resign due to the fact that she posted a picture on Facebook in which she was holding a glass of wine and a mug of beer [23]. Results from early empirical studies of student Facebook users suggest a behaviour that is somehow inconsistent with the stated privacy concerns. In a 2005 study of Facebook users at Carnegie Mellon University (CMU), Gross and Acquisti have found that the majority of users shared a large amount of personal data, but only a small percentage have actually managed to change their privacy settings [58]. Moreover, in a follow-up 2006 study, the very same authors have found that even users who stated that they were concerned about privacy tended to reveal a great amount of personal informa-

tion, which represents a great discrepancy between stated privacy attitude and the actual behaviour [1]. However, these studies only examined college students, and thus the results might not generalize to other user-populations. For instance, Joinson conducted a study with non-student users of Facebook in 2008 and managed to find that the majority of the respondents – about 57,5% – reported having changed the default privacy settings [70]. In addition, Wang et al. [138] conducted online surveys and in-person interviews in 2011, in order to examine a broader segment of population than just the aforementioned ones, and their results have shown that one way of preventing unintended privacy errors is to restrict the visibility of posted content, using Facebook's granular privacy controls – which allow users to customize their privacy settings for each post activity. Even so, these controls are not widely used and they seem to be difficult for users to manage, since they are too complex to understand [91]. This is also supported by the fact that several users typically have a large number of friends in Facebook – an average of 130 friend contacts [1] – and thus, feel difficulties on remembering who they are [138]. Thus, there is clearly an opportunity to understand the major privacy concerns of the elderly user-population and refine the studies that were already made, in order to perceive which privacy management mechanisms could be better improved or provided in the Facebook SNS.

2.5 Summary

In this chapter we have made an introductory presentation of several aspects relating to the ageing population, concretely age-related changes to the several cognitive and perceptual aspects. Also, we have focused on very specific and important issues, the social alterations that usually come associated with later life. Considering this aspect, we managed to investigate and detail the most concerning issue regarding the older adults, social isolation, as this issue has revealed to affect most of the older adults – mostly in early ages. Thus, we shed light into several research efforts that have previously investigated the importance of the family as the main motivator for the improvement of social communication among the elderly population. Further, we have made an overview of older adults and their attitudes and habits towards ICTs, as the main facilitator for their interaction with Social Network Services (SNS). This last issue was inserted in the context of the Tablet Devices – as these have revealed to be extremely well-accepted by the elderly user-population, in previous research –, with background of several projects that have been made using SNS with improved support for older adults. A discussion of the main challenges that had to be considered when aiming to build a new SNS focussed on the older adults, has also been made. Lastly, we have discussed the main issues that concern the actually most used SNS – the Facebook SNP –, regarding its support for the older adult interaction with it, and the hypothetical opportunities for improving the SNS.

[1] http://www.facebook.com/press/info.php?statistics

Chapter 3

Methodology

In the previous chapter, we have presented a literature review which has enhanced our understanding of ageing concepts and age-related physical, cognitive and social declines. We have also considered one of the most concerning issues among the elderly population, social isolation, and how that problem can be suppressed by encouraging close communication with family. Regarding this issue, we have focussed on the older adults' main characteristics and their relationship with technology, in particular with tablet devices, identifying their main limitations. Lastly, we have identified social networks as the main facilitator for communication between individuals, and studied how the most used SNS – Facebook – can be improved in order to better suit the older adults' requirements within this scope.

We will now make a brief revision of our research questions and objectives, which were outlined in the introductory chapter, and detail the research methodology that was used to answer such questions. Regarding the methodology, our work was first divided into three different phases of research. Each phase was designed in order to answer one or more research questions. The phases embedded in our work and their relation with the research questions are outlined in the following manner:

- **Phase One** provides answers and insights to the following questions:
  - RQ1: What are the main activities an elderly user wants to perform in Mobile SNS?
  - RQ2: What are the main challenges of elderly users when interacting with Mobile SNS?
  - RQ3: What are the main requirements for an SNS mobile interface targeting older adults?
- **Phase Two** mainly aims to answer:
  - RQ4: How can the older adult accessibility recommendations be designed into a Mobile SNS?

- **Phase Three** has the objective of answering:
  - RQ5: Can an interface built following older adult accessibility recommendations be more attractive for older adult users than the actual Native Facebook Mobile interface?

In the scope of our work, we decided to use a research methodology based on User Centered Design (UCD). The methodology had its origins with the seminal work of Norman and Draper [105], but others have further optimized the basic approach [136]. When applied to Human-Computer Interaction, UCD mainly focusses on the design of new perspectives that are essentially based on the requirements that are derived from user studies. Following this approach mostly encompasses the partition of the research into several phases, as well as the inclusion of participants in each one of those phases. Considering our work, we have divided the research into three phases, and each one of them followed an approach in which we included several participants.

3.1 Phase One: Understanding Older Adults' Usage of Facebook

Phase one aims to understand what is the general usage that a typical older adult makes of Facebook, as well as their main limitations within that usage. Also, this part of our research has focussed on the perception of the main reasons that older adults' have for not using the SNS in general. Concretely, this phase predominantly focuses in discovering which are the main activities that the elderly users want to perform in Mobile SNS, and what challenges accrue regarding the activities performed.

With the goal of understanding and characterizing older adults' usage of social networks, we start our work by conducting a series of user studies, following a mixed methods approach, combining focus groups, interviews and direct user observation. The methods used on our work are based in an extensive literature revision that has given us several supportive indicators that show that these approaches result in a better perception of the user's interaction with SNS, and concretely the Facebook SNP. Our preference for these approaches was recently justified by Langdon et al. [80] as their approach have considered the advantages of triangulation of data sources [132]. Following this method, data is collected from multiple approaches such as: literature studies, quantitative data analysis of data from **user trials**, user **surveys** and **focus groups** and qualitative analysis of observational data from **user interviews** [132]. Recently, Coelho et al. [26] also used such methods when they have managed to collect – in the scope of the European project GUIDE – end user requirements for older adults resorting to a **mixed methods** approach.

We planned to conduct interviews and focus groups with around 20 participants, in two distinct institutions: a Senior Healthcare Institution and a Senior University. With

this first phase of the study, we aim to understand what are the main behaviours that older adults perform within the scope of a Mobile SNS, as was previously defined in our first research question (RQ1). In a second phase of the study we run an experimental session with fewer participants in order to better understand what are the main challenges that older adults find when interacting with Mobile SNS (RQ2). From such studies, along with our extensive literature revision, we plan to compile a set of design recommendations (RQ3) for the design of social network interfaces with a focus on senior users.

3.2 Phase Two: The Facebook-based Prototype

The objective of phase two is to improve a Mobile SNS in order to meet the elderly users' requirements. A brief review of literature has revealed that older adults' necessity to use new technological devices is greatly increasing and this becomes a serious issue if we consider the ICT gap between younger and older generations [111, 149], but still the design of such technologies has not yet taken into account the older adults' specific needs, as stated in [30, 76, 56, 149]. With this in mind, we considered the opportunity to develop a technology – resorting to prototyping – that would be mainly focussed on the older adults' requirements. This is greatly supported by our literature revision, particularly in [16] when the author states that older adults' limitations using new technologies can be overcome by designing products that better meet the elderly needs and expectations.

Our implementation of the prototype is essentially directed to Mobile devices, since – as was also shown by our literature revision – these have received an increasing amount of attention as platforms for developing specialized applications regarding the needs of the elderly population [24, 72, 87]. Also, the type of applications which are developed for this type of devices allow older adults to maintain social relationships and monitor their health, while maintaining independence by continuing to live in their own homes [111], as was shown in previous research.

In order to develop the prototype, we aim to follow an approach that considers an iterative model, which is characterized by having an *effective (rapid and adaptive) response to change* [7, 94]. By following this model, we are able to have into account several iterations, in which the prototype development will take place. Accordingly, every iteration follows the same steps: (1) users' requirement gathering, (2) design and implementation, and (3) user trials. In each iteration we aim to consider the prototype's already implemented functionalities, as well as the functionalities that we consider to implement next. For such purposes, we will conduct several user trials – with both senior and non-senior user, that is not only users with more than 65 years of age –, in which we aim to understand which functionalities are considered most relevant by the users, as well as the ones that should be considered as removable from the prototype. Thus, these user trials mainly serve the purpose of choosing between the design decisions that are being considered in

each of the iterations (see Section 5.2 for further details).

Summarising, for this phase we plan considering the issues reported in results from the first phase – suggestions from the user studies' participants – from which we are able to derive recommendations for the design of a Mobile SNS that considers the older adults' interaction with SNS. This clearly suggests the inclusion of a methodology that uses UCD methods, in order to fully consider the older adults' requirements regarding the building of the aforementioned prototype. Such recommendations will be then translated in the development of a prototype based on Facebook, that suits the older adults' accessibility requirements interacting with the SNS (RQ4). The prototype will be developed to Mobile Devices – concretely Tablets – and further details about the prototype implementation and design decisions are described in Section 5.2.

3.3 Phase Three: Assessing the Design of a Facebook Interface tailored for Older Adults

In the last phase of our work, we will essentially assess the older adults' interaction with both the Facebook-based prototype – which is planned to be developed in the previous phase of our research (Chapter Five) – and the Mobile Native Facebook Application. This assessment will be made considering **accessibility** and **usability** as essential metrics to evaluate the older adults' interaction with both approaches.

We aim to perform the studies with an amount of participants representative of the elderly population, adequate for a qualitative analysis, as well as tasks that are exemplary of the activities that the older adults perform on a daily basis. In such studies, we aim to compare the prototype developed in the last phase of our work (Chapter Five), with Native Facebook Mobile Application. We also plan to perform both a quantitative and qualitative analysis to the results obtained. The latter analysis will be made regarding direct observation that has been made in the user studies, whereas the former analysis will be made to the questionnaires to which the participants responded in the user studies.

The results obtained from this phase of our work helps us defining a supportive background in order to investigate how can an interface built following older adult accessibility recommendations be more attractive for older adult users than the actual Native Facebook Mobile interface (RQ5).

3.4 Summary

In this chapter we have described the research methodology that was used in order to carry on our work. We have outlined the different phases of our work and how the research questions ad objectives map into each of the phases. Moreover, we brought insight into how such phases responded to the aforementioned research questions, by provid-

ing both solid background from literature revisions and also the description and detailed characterization of the work that was enforced in each phase. The following chapters will individually present the three phases of our work, with detailed description regarding the iterations throughout which our research has passed.

Chapter 4

Understanding Older Adults' Usage of Facebook

In this chapter we describe the first phase of our research, in which we have conducted user studies in order to understand which is the usage that older adults make of the Facebook SNS. The user studies have been performed in two distinct phases, which are described in detail in this chapter, with full characterization of the procedure, methods and participants, regarding each one of the phases. Further, we report the results and findings that have been obtained from the user studies, providing discussion and insight into the main findings, regarding the participants' resulting suggestions. Finally we describe how such suggestions are then translated in the form of recommendations for the design of a SNS for the older adults.

4.1 Objectives

This phase of our work was focussed on the perception of the older adults' usage of the Facebook SNP, defining and categorizing a range of behaviours that the participants have performed in our studies.

Accordingly, this first phase of our work mainly seeks to answer the first three research questions:

- RQ1: What are the main activities an elderly user wants to perform in Mobile SNS?
- RQ2: What are the main challenges of elderly users when interacting with Mobile SNS?
- RQ3: What are the main requirements for an SNS mobile interface targeting older adults?

In order to answer such research questions, we have conducted user studies in two distinct phases. The first phase involved the usage of interviews and focus groups and

was conducted within a Senior Healthcare Institution and a Senior University. The second phase was conducted making use of direct observation methods and with two older adult participants.

4.2 Characterizing Older Adults' Limitations

Previous research has been made regarding elderly interaction with technology and mobile devices [104], addressing their main issues when interacting with these devices. Moreover, there has been an emerging set of studies that mostly focus on understanding several issues related with the elderly interaction with SNS [9, 19, 59]. However, there is still a big gap at understanding the challenges that the elderly population may have when interacting with the Facebook SNP. Thus, the first step towards closing that gap is to understand that user-population's main limitations. Additionally, by identifying their most performed actions on Facebook, we can have a full perception of the older adults' usage of that SNP.

The aim of the work stage reported in this chapter was to understand which was the usage that older adults make of the Facebook SNS. We believe that the usage that older adults make of these services are of a diminished range of behaviours, when compared to the behaviours performed by other user populations. In addition, we hope to better understand the main motivators and what makes the older adults' want to perform these behaviours, by examining elderly interaction with such interfaces.

Accordingly, the first phase of our work seeks to answer RQ1:

RQ1: What are the main activities an Elderly user wants to perform in Mobile SNS?

4.2.1 User Studies

With the goal of understanding and characterizing older adults' usage of social networks, we started our work by conducting a series of user studies, following a mixed methods approach, combining focus groups, interviews and direct user observation.

First Phase

Our goal in the first phase of the user studies was to investigate the use of Facebook on tablet devices, among the senior population. We also wanted to understand how Facebook can be improved for this type of users. To achieve these goals, we conducted focus groups and interviews in two different institutions, a senior healthcare institution and a senior university. In both, our goal was to perform focus groups to emphasize some discussion between the several individuals. Moreover, by targeting distinct institutions, we wanted to understand if these seniors have different habits concerning new technology and social network services. In the senior healthcare institution, it was not possible to gather all

participants in one room at a specific time and individual and group interviews focusing the same issues were performed with 20 participants over a period of three days. At the senior university, we could conduct one focus group session, as a whole class was made available to run a focus group with a total of 9 active seniors for a period of about 1 hour.

For both focus group and interviews we focused on habits concerning the use of Facebook and Tablet devices. The participants were asked if they have ever used Facebook (or seen it being used by others), and about their relationship with technology, i.e. which devices they use in their everyday life. Discussion was also focused around Facebook use on Tablet and about the advantages it could bring. Concerning the use of Facebook, questions were related to how often they use it, for what purposes, and on which devices. They were also asked what they feel are the most relevant and irrelevant functionalities, what is missing or never used, if they have preferences for any type of groups of users, and what can be improved for targeting its use by seniors. For the ones who did not use (or know about) Facebook, we tried to understand why not, and if they had the chance, would they like to use it, and for what. Additionally all users were asked if they keep contact (or would like to) with their families through Facebook, and which type of media they would prefer while (or if) using the application.

A total of 29 people participated in the study. Their ages ranged from 51 to 93 years old (AVG = 69.5, SD = 13.0). Of the 29 participants, 22 were female and 7 were male. Considering the different institutions, a total of 20 participants were from the senior healthcare institution, averaging 71.8 years old (SD = 15.2), while the 9 participants from the senior university averaged 64.6 years old (SD = 1.8). From both interviews and focus group, 18 people know what Facebook is while 11 are not familiar with it. From the ones who know about it, 15 currently use it. This means that just over 50% of the participants in the study use the social network. Participants who use Facebook have an average age of 62 years old, while the participants who do not, are on average 16 years older. Concerning the frequency of use, about 47% of the participants that are on Facebook, uses it more than once per day, while 53% access it once, twice or three times per week.

Regarding Tablet interaction, 12 (41%) participants were used to interact with this type of devices, while 17 (59%) are not. However, from the 12 participants who know what it is, only 6 use this way of interaction (with 3 using smartphones). This means that only 21% of the participants in the experience, but about half of the ones who use Facebook, uses a Tablet as a way of interacting and accessing information. In what relates to the preferred type of media in Facebook, almost all participants agree with each other on images as the type of content which attracts more attention. Conversely, only 2 participants said to pay attention to videos. As it takes too long to watch, they tend not to pay attention or giving up on watching.

Second Phase

With the second phase of the user studies, we tried to further confirm the findings obtained from the first phase, regarding habits and limitations that would hypothetically have not been discussed in the interviews and focus group. To this end, we performed two experimental sessions of about 1 hour each, with two older adults at their homes, in a relaxed environment. We asked both of them to perform several typical tasks on Facebook using an Android Tablet device. In this section we describe the procedure and characterize the participants in it.

The first participant (participant1) was an 86 year old female without any technological background nor any contact with Facebook. The second participant (participant2) was a 62 year old female and a frequent user of computers. However, she has only experienced Smartphone's once or twice and never used a tablet before. She uses Facebook almost every day. Both participants were given a Tablet with the initial Facebook page open and were asked to perform the following tasks: 1) Share information with your friends/family; 2) View the profile of one of your relatives; 3) Browse the latest news. Afterwards they were allowed to freely explore the application. During each task the moderator tried not to interfere with the participant interaction, however every time participants asked a question the moderator answered. Notes were taken during the interaction.

4.2.2 Results

We will now report the results obtained from both phases of the user studies, which were conducted in the Senior Healthcare Institution and Senior University (First Phase), and with two senior participants (Phase Two). Further we discuss the main findings that resorted from the studies.

First Phase

The main reason for using Facebook, appointed by half of the participants of the **Senior Healthcare Institution**, was talking with family and friends using the chat functionality. Seniors in the institution also like to share what they feel (4 participants), see what their friends are saying (2 participants), playing games (2 participants), see photos (1 participant), read news (1 participant), consult information related with groups (1 participant) and finding events (1 participant). Additionally, one participant also explained she only used Facebook to give advice to family members and friends. These tendencies were also verified when asked about the most relevant functionalities: once again the chat functionality was appointed by the majority followed by the sharing/posting functionality. Still relevant, the possibility of knowing new people was referred only by one person, proving to be an almost irrelevant feature for the participants interviewed, alongside with games – more than half of the participants complained about game related activities and warnings

issued by Facebook.

When asked about the reasons for not adopting Facebook, most of the participants appointed security reasons, as they do not know how to change the privacy policies and restrict to who, and from who, they post and read content. Additionally, one participant indicated not having any family members left who she would be interested in keeping contact with as the main reason for not using the application. In the same way, more than 50% (8 in 13) of the participants who have not adopted the SNP expressed the desire to accompany their family members life on virtual tools (even considering almost all of them had never had any contact with personal computers). All the reasons pointed out for both adopting or not the Facebook SNP, show a possible relation between Facebook and family relationships, and the important role around family when focusing on social networks and the senior population.

Regarding what are the most important functionalities in the context of family oriented activities, the necessity of a more practical (simple and easy to use) interface, as well as the capabilities of direct (virtual) contact with others and organizing events with family members were appointed as the main functionalities. Regarding functionalities still not present in Facebook, one participant expressed the desire of having the capability of remembering the childhood of every family member, and other indicated the possibility of having access to health services through Facebook. An help mechanism was also requested by two other participants, "because sometimes we get into situations we do not know how to get out off". The same two participants expressed the possibility of having some family oriented functionalities, such as a family newsfeed, as a rather important reason for people of their age to adopt Facebook.

Concerning the benefits of using Facebook on a Tablet instead of a traditional PC, the only participant to reject tablets explained he did not like the virtual keyboard on the screen and preferred the traditional input method. Additionally, one of the participants with no preference, explained she prefers non-computer activities like soap operas. However when introduced to the Tablet she was one of the most excited participants. On the positive side, for these participants the main reasons for using Facebook on a Tablet, are mobility (5 participants), ease and convenience of the interaction (2 participants), and the fact of being "better for more intensive use". The fact of being "closer to a book" and for that reason "easier to read than in the computer" was also referred by one participant. Moreover, five participants appointed the main reason for not using the Tablet was not having one. Other two however, did not see any necessity in using one or had no time for "learning to use a new thing". No participant from the Senior Healthcare institution used a smartphone as an alternative for interaction in social networks, but only for telephone based-functionalities.

At the end of the interview each participant was inquired about the current Facebook interface, what are the main difficulties accessing it and what they would change to make

it more accessible to the senior population. The main difficulties pointed out were the frequent layout changes operated by Facebook, obligating them to a new period of learning, the privacy definitions, the existence of non native language text, and the difficulties when publishing or uploading photos. Additional factors pointed out as upgrades needed for the Facebook application, were speed ("should be faster"), the inclusion of type of content/group/thematics filters, the possibility of giving greater relevance to favourite contacts, or people with which participants interact more. Some of these suggestions already exist on Facebook, but the fact that senior participants do not know about it, shows they should be accessible in a different way so they could use it.

Regarding participants from the **Senior University**, almost all of them said to use Facebook more for consuming information than for updating their status and sharing information with others. Contrary to this argument, and in agreement with what participants from the Senior Healthcare Institution reported, when asked for the main functionality used when using Facebook, the majority (5 participants) agreed on "talking with friends", not necessarily by chat, but also by posting information on each others "wall". Other main functionalities appointed, were the ability to find and keep in contact with old friends and family (2 participants), and receiving notifications and messages on each others birthdays: "I felt better when I received all those messages, somehow I felt less lonely". Moreover, all participants agreed on the less important functionality as being the ones offered by games, explaining they did not understand how to play the majority of them because "they are too complicated". There were also major complaints about invitations received all the time from games they do not know or want to play and about advertisement all over their pages. These opinions are in line with the ones referred by the previous group in interviews, however a higher focus on family is present on the first group.

When discussing reasons for not adopting or using Facebook more frequently, all seniors except one, agree on the problem with privacy issues as the main difficulty when using the service. Other difficulty appointed was getting frequently lost in the application because it has to many functionalities on the same interface (3 participants). Two users also reported difficulties when uploading and posting photos: "We have to to do a lot of things, and I get lost in the process." One of them admitted she ended up giving up from posting photos on Facebook. Also, they are afraid of getting addicted to it, as they see others do: "I see people who used to be close to us, without any time available because they are on Facebook almost all the time". All agreed also when one participant stated "It makes me sick, those people who publish in Facebook everything they do: 'Now I'm eating, now I'm going to the bathroom, now I'm seeing a movie'. It's ridiculous". One of the participants agreed she used Facebook all the time to share her poetry with her friends, however she disagreed on that being necessarily negative: "I'm there all the time. But I think it's a good thing since I finish writing more than I would without it."

Concerning the use of Facebook for family oriented activities it was possible to verify

a big difference between these participants and the ones from the senior healthcare institution. Only a percentage of about 30% admitted they used Facebook focused in the family. Additionally, by "talking with friends" they meant both family and people with no family ties. They left this quite explicit when stating "I don't want to interact only with my family" or "I want both in Facebook". However, and in accordance with the previous institution, these seniors also want to restrict interaction only to people they know and have little interest in making new friends online. This non-focus in family was also observable when specifically asked about the features they would expect to find in an application focused in Family and older adults: they indicated the necessity of having some kind of cultural feed related with their age – they wanted this to be automatically created for them –, and they would also like to receive more information related with health homes, health services and social events. Once again, if we compare these necessities with the functionalities suggested by older adults in the healthcare institution, we notice a big shift from family oriented content to cultural oriented content. One possible reason for this is the possibility that more active older adults are less dependent from their family and seek information related with a more active lifestyle, feeling less isolated and dependent of family members. Still related with senior adults interests, all participants expressed the necessity of having some kind of functionality they could use to filter the type of content they receive/read as well as the possibility of posting different information to different groups of friends or family. They know Facebook already makes this available for them, but they don't know how to use these functionalities.

Curious enough, is the fact that 2 participants started using the tool for reporting activities (like registering a complain on a specific page only available in Facebook) but ended using it almost everyday for every other purposes. In fact, one of these participants stated "I only use Facebook for complaining, and to say bad things about the government" and also "I don't like Facebook at all" but admited using it every day for any reason (she also did not use it for family purposes as she stated not to have any family left).

Benefits of using the Tablet instead of the PC were not at first appointed by the different participants. However, in the focus group, when one senior appointed mobility as the main advantage – "I can use it anywhere I am. I use the Tablet on the weekends when I'm away on my country house and I don't have a PC there" – all the others agreed (even the ones who had never seen a tablet before). Additionally, when asked why they did not use a Tablet instead of a PC, most justified with not owning one. These reasons were also two of the main ones appointed by the participants in the interviews.

Finally, when asked about the Facebook interface and if they would like to have a different one centred in older adults, some of the participants worried they would be treated like different participants and opposed to the removal of some functionalities they do not use: "Right now we do not use it, but probably in the future we will want to use those features". Other half recognized they would enjoy a more simple interface and once

again appointed privacy issues and functionalities as the main factor of improvement: "I do not want to see information about people I don't know", "If I could not be apprehensive while using it, I would use it all the time, because there is a lot of information there that is not possible to find outside Facebook". One participant also said "Old people reject what they don't know well. If we could have something more easy and practical to use, focused on our interests, we would use it a lot more".

Second Phase

Both participants were asked to perform the following tasks: 1) Share information with your friends/family; 2) Find person X (a daughter) and select her profile; 3) Find person Y (a grandson) and select his profile; 4) Browse the latest news of your family; 5) Find the youngest person in your family and (once there) find yourself and select your profile. All tasks were performed in our prototype and Facebook's native application.

From the obtained results, we have perceived that participant1 required initial assistance from the moderator to conclude the first task, due to problems related with the virtual keyboard. As she had only typed text on a typewriter, she was expecting to have a key for when she wanted to change lines. Also, she took some time to get used to the touch interface each time she wanted to select a character (made several mistakes and did not know she could erase it). At the end, the content of her post was family related: "I invite all my grandsons to dinner". In the second task, participant1 did not know what to do and kept asking for help from the moderator. Eventually (after 10 minutes) she learned where she had to go to search for a specific participant, where she wrote (also with difficulty) the name of one of her grandsons. She smiled the first time she saw his picture saying "Here he is!". She also reacted when acknowledging his workplace: "He is a doctor you know?".

Finally on the third task she connected the word "news" on the interface with what the moderator was asking and was able to scroll trough the newsfeed. Relevant is the fact that having never experienced a tablet, she intuitively understood how to scroll to the list of posts in the newsfeed. Additionally, she reacted with joy every time she saw a picture from a family member. Contrary to this reaction, whenever she saw information related with people she did not know, she looked away and asked for the moderator to remove that information from the screen.

participant2 performed all the tasks with almost no problems or need for assistance. As a PC Facebook user, she only had issues locating the main menu the first time she logged into the application. She also did not need any moderator help and after less than one minute, she identified the small blue box on the top right of the interface as a shortcut for expanding the menu.

By analysing participant1's performance, we have multiple indicators that show that family is the main motivator for elderly use of Facebook. This is supported by several

reactions like: seeing information related with a relative workplace, or photos; or even when sharing new updates related with family. Moreover, from the analysis of participant2's friends on Facebook, we observed that about 33% (19 in 57) are family members. When we compare this data to recent research [60] – where we can see that an average of 20% of a typical user friends are family – we have another strong indicator favouring family relevance in social networks.

4.3 Recommendations for the Design of SNS

Following the results of the focus groups and interviews performed in the two senior institutions and the user experience session with two participants, important recommendations can be derived related with the development of a social network for older adults. We have grouped these recommendations in the following categories: privacy, groups, family, content, functionalities and interface. In the following paragraphs we discuss these recommendations.

4.3.1 Privacy

Privacy options "Post to" and "View from" must be simplified: The main issue with Facebook privacy options for senior users, is the way they are available or configurable. Senior users do not know how to change their privacy options for specifying who can see what they share – "Post to" – and from whom they want to consume information – "View from". Results from this phase revealed that options need to be simplified in order to be more appellative for senior usage Facebook, or even to provide a better usage of the same. Instead of having to interact with complex menus, users should have a set of options explicitly available and usable every time they want to make a post, from which they could be able to decide to whom they want to post to. Similar solutions should be implemented regarding the "View from" capability, with the almost invisible arrow on the top right of each post being replaced by a more easily identifiable option, from which seniors would chose if they want to see more updates from that contact/source.

4.3.2 Focus on Groups, not Individuals

Considering that different senior users have different necessities, it is plain to see that their choices regarding the focus of SNS would be different. Despite this fact, the majority of the participants agreed on having group-based content and functionalities.

Inclusion of a "favourites" group with the most "interacted with" contacts: Facebook already automatically creates some pre-defined groups for users, based on several metrics, such as the places where people live, the schools they attended and the places where they worked. It also creates a pre-defined group called "favourites". However, in

this group users have to manually define who are their favourites contacts on the SNP. From the data collected, several users felt the necessity of having this kind of group for posting updates only to the people they normally interact with the most. As they do not know how to manually define their favourites, this should be automatically assigned by Facebook, having as core assets the most frequent interactions of a user (contacts to whom he or she likes more content, shares more content or talks the most using the chat functionality).

Implementation of Cultural and Health-based functionalities and groups: Seniors who are more active, requested the inclusion of cultural and health functionalities on Facebook. Thus, several functionalities were suggested by them, which included a cultural newsfeed (already available after some configuration steps on Facebook, but not known by seniors and possibly for that reason an automatic and more accessible feed should be implemented); an health newsfeed; the existence of cultural groups (also already possible but too complicated to access it); and the possibility of creating events related with cultural and health topics. Implementing such features without raising the complexity of the general interface is also a challenge, which will be discussed in further topics.

4.3.3 Focus on Family

Special relevance must be given to the implementation of a family group and family-based functionalities as a step for more isolated seniors to adopt Facebook. As we have shown in our literature revision, older adults' interaction with SNS is mainly motivated by the hypothetical presence of their family, and the clear chance of interaction with it [88, 119, 121], and accordingly our user studies have shown that users have once more suggested the focus on family-related content.

Interaction must be focused in Family for older seniors: Seniors from the healthcare institution appointed family as one of the main reasons for using Facebook. They also chose functionalities related with posting and consuming information on and from family member profiles. Even the ones who did not know how to use Facebook, stated that they would like to use it with those goals in mind if they were given the chance. The same was also verified on the experimental phase of the experiment, with the oldest participant reacting positively every time she saw information related with a family member, and writing family-related posts. Taking all this into consideration, an obvious recommendation is that those users should have their interaction focused around family. However, seniors from the senior university referred they do not want to use a Facebook version focused only around family because they also use it to interact with friends outside family, like for example, their university colleagues. One possible solution is to aim for implementing an automatic adaptation of the interface based on the user's profile. However for this to be possible, additional profiling steps would probably be necessary as

Facebook's profile data would not be sufficient. A less demanding solution would be the possibility of having a Facebook interface focused around family features as an optional choice for the users.

Inclusion of family-based features: Following the first implication related with family use, several users also identified that some features were actually missing within the Facebook SNP. Some of these features were mainly related with capabilities focused around interaction with the users' family members. Examples of these family-based features, are the functionality of creating family events or the suggestion for an option capable of "reviewing the childhood" of each family member. The implementation of a family newsfeed was also suggested by several users. However, since this feature is already available on Facebook, it should be better disseminated and highlighted for senior users to be capable of getting the best out of it.

4.3.4 Content

Facebook is all about content, and senior users have different attitudes towards different types of content. For this reason, for seniors, interaction should focus more on photos and images than in other less relevant types of media.

More relevance must be given to Photos and Images than to other types of content: Photos are for senior users the main focus of attention when browsing the newsfeed. In the Facebook mobile application, when running on Tablets, this type of content is already highlighted from simple text content. However, in the PC native application the relevance given to photos is the same as to any other type of content. There is a clear understanding from senior user reports, that photos should always be the main type of content focused by the application, and for that reason, both on Tablet, Smartphone and PC, presentation of this type of content should have more relevance than any other. Possible solutions are for photos to occupy a bigger range of the screen, or have a particular newsfeed just for photos.

Photos must be easier to upload and publish: Still related with the same type of content, users reported difficulties when uploading photos or images to Facebook. This type of operation should be, for that reason, simplified and also made faster with less steps, less features, and more focused on a simple "upload when posting" functionality.

Less relevance must be given to Videos than to other types of content: Senior users showed indifference regarding Video content, described as "boring" or as "a waste of time". Excluding video content from Facebook would not be appropriate as still there are senior users who enjoy watching videos, even if only occasionally. One possible solution is to give videos less relevance than to other type of contents. Changing the way they are presented (e.g. reducing the size occupied by videos on a regular Facebook newsfeed) or having a video only newsfeed are two possible ways of achieving this.

Newsfeed should allow filtering by type of media: From the recommendations re-

lated with both images and videos, a relatively obvious recommendation would be the inclusion of media type filters in the newsfeed functionality. These filters are already available, for example in the mobile Facebook application for Apple's iOS. Even so, these filters have not yet been implemented for PC or Android devices, and should be taken into account when considering the development of an interface for older adults.

4.3.5 Functionalities

Senior users do not use each and every functionality in Facebook, and thus a special focus should be naturally given to the ones they use more often. Meanwhile, other functionalities should be simplified or made accessible for the older adult to be capable of making the most of it.

"Chat" must have a central role in Facebook for Seniors: As the main functionality pointed out by users, the Facebook "Chat" feature should have a more central role in the whole social network application. Putting all other functionalities around it could be one idea to be tested with real users, however such a radical change on the way Facebook works could be dramatic to everyone who is already used to its UI. A less radical solution could be always keeping the "chat" expanded, or even incorporating the chat in each contact profile page.

"Games" should be simplified and more traditional: Senior users do not play the majority of games in Facebook, and often hate the fact that they constantly receive updates on games they do not play. To be played and have adherence by senior users, games should be focused on traditions, thus making allusion to the ones they used to play when they were younger. For such reason, Facebook embedded games should probably be based on a simple 1 vs 1 or two against two gameplay.

Functionalities related with "friends of friends" or "getting to know new people" should be avoided or made optional: Senior users do not want to interact with people they do not know in real life. As the results from our user studies have shown, senior users often want to use Facebook to interact with their friends, not to make new – or only virtual – ones. As all of them seem to agree in these principals, functionalities like "people you might know" should remain optional so they can find people they know, but still content in newsfeed that is related with friends of their friends should be avoided. For example, if someone they have as a contact adds other contact as a friend, this should not be presented to them to avoid feeling a loss of control within their social experience. Also, content that is shared by their friends which is originated from a "friend of a friend", should always be presented as content that is explicitly from their friends, or not be presented at all (e.g. in the desktop Facebook application, the original contact is only represented by a mention to the user's name, while contrastingly in the mobile version, a full profile picture is shown side by side with the respective content of the post. Therefore, our conclusions pointed that the latter presentation solution should be avoided regarding senior users).

4.3.6 Interface

The Facebook interface is still too complex for older adults, and some recommendations can be drawn both from watching them interact with it and talking about it. Special interest goes for the use of non-native language and the necessity of simplifying the general interface preventing users from getting lost while using it.

Facebook interface must be simple, constant and provide "safe points": For seniors, the current interface is too complex and often leads them to situations where they feel lost and do not know what actions to perform. It also leads to some mistakes, as for example, users posting content originated from standard status messages (e.g. "Write something"). To provide a better interaction, the interface should be simpler, with less buttons and less functionalities, focused around the main operations used by seniors. The interface should also be constant, and layout changes should be avoided and progressive (users should not be obligated to change their behaviour, or adapt abruptly to a new interface every time a new update is made). Finally, "safe points" like a "home" page or a clearly identified profile page, should be easy and obvious to access every time a user feels lost.

Avoid non-native language interface terms and content: Terms used in the interface should always be in the senior user's native language. Also, findings obtained from the focus group reveal that non-native content should be avoided, specially if the user is not familiar with the language. Content shared by the user's friends which is not in the appropriate language should be hidden, otherwise the user will have the feeling that his or her personal space is being 'invaded' with terms he or she is not capable of understanding (which can eventually result in user's frustration).

4.4 Summary

In this chapter we have described the first phase of our research, in which we have conducted user studies in order to understand and have a clear perception of which is the usage that older adults make of the Facebook SNS. From the focus groups and interviews performed in the two senior institutions and the user experience session with two participants we have derived several recommendations related with the development of a social network for older adults. Such recommendations have pointed to six crucial aspects: privacy, groups, family, content, functionalities and interface. Regarding each one of these aspects, we have now good indicators that a Mobile SNS that suits the elderly requirements, must take into account privacy concerns and their accessibility, as well as focusing on family-based and group-based functionalities. Moreover, there should also be a focus on content presentation and filtering, with special concerns regarding interface aspects.

Chapter 5

The Facebook-based Prototype

In this chapter, we describe the process through which we have considered the requirements obtained from the last phase of the research, in order to build a tablet interface that provides access to Facebook services to older adults. We start by describing how we mapped the requirements into the several design concepts, and how such concepts can be translated into the development of a Mobile SNS. Through the process, we make a detailed reference to the several iterations that the development process has passed through, along with the design decisions and the rationale behind each one of them.

5.1 Objectives

This phase of our work aimed to understand how the older adults' requirements when interacting with Facebook – which is information that has been provided by the results from the previous phase of our work –, can be mapped into design decisions regarding the implementation of a Facebook-based Mobile SNS.

Accordingly, this second phase of our work aims to answer the fourth research question:

- RQ4: How can the older adult accessibility recommendations be designed into a Mobile SNS?

In order to answer such research question, we have implemented a Facebook-based prototype following the recommendations obtained from the previous phase of our work, in order to provide a better interface for the older adults interaction with the Facebook Mobile SNP.

5.2 Applying the Recommendations for Older Adults' Improved Access to Facebook

In this section we discuss how the recommendations that were obtained in the first part of our work, can be applied and divided among the concepts and topics on which we shed light before. For such explanation, for each topic we describe our implementation and design decisions that were taken into account in order to follow the recommendations. Moreover, we have only focussed on some of the topics referenced in the previous phase that were considered most important. This is justified both by the fact that some of the unconsidered issues were not considered as relevant as the ones we have focussed on, and by the fact that our lack of resources has conditioned the inclusion of the aforementioned issues into the scope of our work.

The prototype was developed resorting to the Facebook API and Software Development Kit (SDK) [47] for the Android Framework, and the typical Android SDK [55]. Such tools were used throughout the whole development phase and accompanied the design changes that were considered. Making use of these supportive tools, we managed to successfully develop a prototype with the main purpose of providing the older adults' an interface that could meet their requirements when interacting with a Mobile SNS.

5.2.1 Privacy and Group's Focus

Since privacy was the most discussed issue by the participants in the first phase of our study, we have mainly focussed on the requirements derived from this issue. Furthermore, considering the fact that privacy was the main reason appointed by seniors for not using Facebook or for using Facebook in a limited way, several mechanisms were considered in order to suppress this issue.

Firstly, we implemented mechanisms that would allow the older adult to see his or her information, as well as giving an optimized presentation of the user profile layout (Figure 5.1). Moreover, the designed solution also shed light into some of the most important issues reported by the participants, regarding privacy concerns. One of these issues relates to the need of having "Post to" and "View from" options much simplified. Thus, we decided to implement several functionalities that would allow the users to publish and view information to and from specific groups of users, respectively. Figure 5.1 illustrates the prototype's support for easy interaction regarding posting mechanisms. Further, such mechanism allows the users to select the specific group of contacts they want to post their message to. This last targeted set of users could be either the user's family, friends, or everyone in the user's social network (Figure 5.1).

Regarding visualization of contents, we also implemented a mechanism that would support the older adult with filtering options. With such mechanisms, the user could opt to view the newsfeed having it directed to one of three specific groups: him or herself, his

Figure 5.1: The prototype's approach for supporting the **post functionality**, with bolster for making the post only visible for a set of users

Figure 5.2: The prototype's support for the **visualization** of the user contacts' newsfeed, with the filtering mechanisms

or her family, or his or her friends (Figure 5.2). Note that these groups were not mutually exclusive, that is the user could always see his or her posts disregard of the group of contacts he or she has chosen to see the posts from. Moreover, we chose to leave aside the implementation of a mechanism that would allow the user to see all his or her contacts' posts, mainly justified by the results obtained in the first phase, which have shown that users only want their **information grouped**, further allowing them to freely decide from whom they want to see the news. Since recommendations obtained from the first phase of our work pointed out that participants often feel the desire of publishing content, we decided to include this functionality embedded within the newsfeed. Moreover, it is worth noticing that – as the approach shown in Figure 5.1 – this solution also provided the user with the option to publish content to either his or her **family**, **friends**, or **everyone in the social network** (Figure 5.2). Every entry in both the user's profile and newsfeed is treated exactly like a post in Facebook: the user could choose to visualize the content, like, and/or comment it. We chose to differentiate the types and label them as shown in Figure 5.2. In this way the older adults should have a better perception of the content itself.

The content publishing functionality addresses the privacy concerns that were mentioned by the participants, in the first phase of our work. The prototype provides a mecha-

nism that allows the user to choose to whom his or her post will be visible: family, friends, or friend of friends. This feature is easily accessible while posting any update. Moreover, the prototype also provides a mechanism that allows the user to choose from which group – him or herself, his or her family, or his or her friends – he or she wants to see the latest news. This feature is easily accessible while posting any update.

5.2.2 Family Focus

In this part of our research, we aimed at following some of the suggestions that we had reviewed in previous research [34, 68, 146], which considered family as one of the main core assets to maintain when considering the design of an interface for elderly users. Thus, we made use of such studies in order to build a structure that could encapsulate family-related content within its core. Furthermore, this structure should still provide a good user experience for the older adults' interaction with it.

The development of this functionality of the prototype has been made in three iterations. In the first two iterations we have developed and experimented new solutions regarding the presentation of family information – concretely the user's **family tree**. In the third and last iteration, we have compared the results of the implementations that have been obtained in the first two iterations. The iterations are described below:

- **First Iteration:** A prototype with a family structure following a *page* approach, with several family-based functionalities, in which the user is able to navigate his or her family's hierarchical structure by switching the pages' context.
- **Second Iteration:** A prototype with a family structure following a *canvas* approach, with several family-based functionalities, in which the user is able to cycle through his or her family's hierarchical structure with *pan* gestures, performed on the device's screen.
- **Third Iteration:** A comparison between the two previous approaches, regarding their usability and accessibility for the older adults.

First Iteration: *page* approach

Initially, we developed the *page* solution to solve the family structuring issue. In the page approach, a part of the user's family tree is presented in a single page, and the user can navigate the tree by selecting a relative, which triggers the loading of a new page (Figure 5.3). For this approach we aimed at keeping every page's structure coherent, and consequently defined an arrangement of relatives inside the page: father and mother profiles are always grouped to the left of the selected profile, whereas the spouse profile is always placed to the right. Moreover, as we cannot know beforehand the number of siblings and sons, we present them in two dynamic lists that are used as containers for

those kin. In this approach, the tablet screen is a page of the family tree, and the user browses the tree through touch.

Figure 5.3: The *page* approach to structure the relatives

In this approach, the user is also able to navigate his or her family tree by simply touching the button "Relatives". The resulting screen would be a container with the same structure and presenting the new view of relatives of the user (Figure 5.4). Notice that the structure is oriented to the user, that is each and every relationship that appears in the interface is presented regarding the user that is currently logged. With his or her relatives structured this way, the older adult may choose to navigate to any level of depth considering the relationship level. The aforementioned transition is illustrated by the figures bellow, in which the user is already seeing her daughter's relatives (Figure 5.4), and then chooses to see a relative of one of the brothers of his daughter ('Pedro', in this case). Then, the user is presented with a renewed structure with all the selected relative's relatives within it (Figure 5.5).

This approach has the advantage of being well structured, always providing the same visualization mode and perspective, since the core arrangement of items never changes in practice. Further, by navigating page-by-page, the user is provided with a filtered access to his or her family members, which can be useful in cases that the user has a clear perspective of his or her genealogical tree, and thus has the perfect notion of his emplacement within the structure.

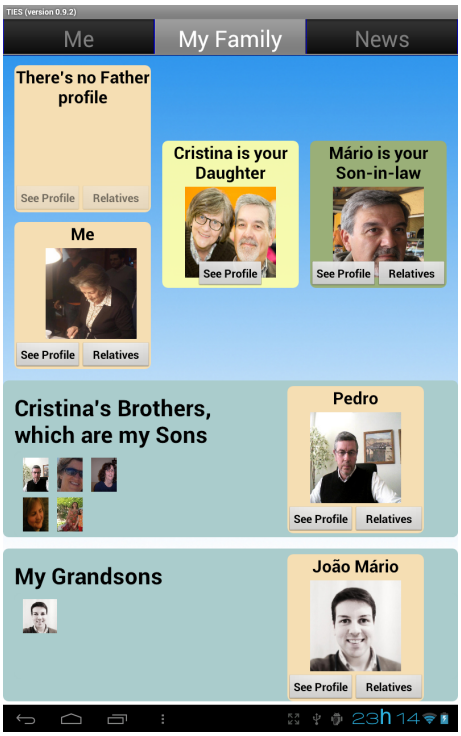

Figure 5.4: *Page* approach presentation after the interaction with one of the relatives (second level)

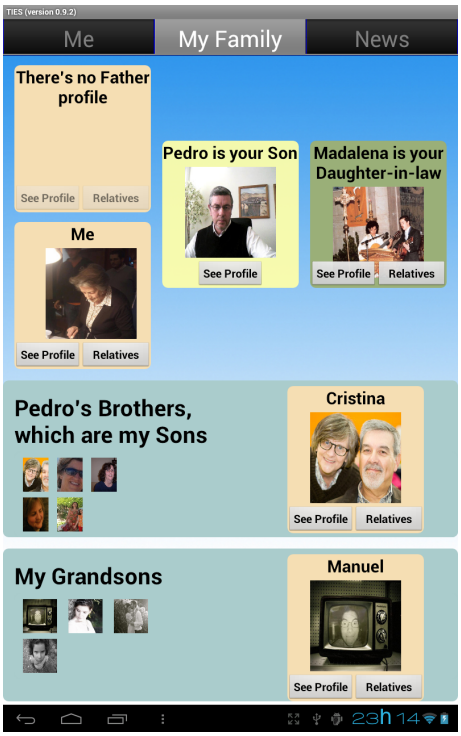

Figure 5.5: *Page* approach presentation after the interaction with another relative (third level)

Nonetheless, this can also be a disadvantage, insofar as there is no full insight of the whole family for the older adult. Thus, this can limit the user's perception of his or her family, as this user-population often does not have a clear perception of their family members.

Second Iteration: *canvas* approach

In order to suppress the limitation that has been referred regarding the previous solution, we decided to experiment another approach. This approach had a different structure, and thus we had to consider several other design decisions, which were then put into practice. Since we were concerned about structuring family members within a single perceptional structure, we investigated several works that had been made regarding that issue.

Past works have been made to discuss and understand the best solutions to structure visual hierarchical data. Some of these works include graph solutions. The graph concept and theory have been widely studied over the past decades and its usage ranges from mathematical theory proof to information structuring. Inherent to the graph theory is the concept of a tree, which is of great importance, specially regarding application of graphs. A tree is nothing more than a connected graph that has no circuits or loops, that is, a graph with no prime paths [13]. It follows immediately from the definition that a tree has to be a simple graph, i.e. having neither a self-loop nor parallel edges – because they both

form circuits. Thus, the tree concept often appears in numerous instances and applicable scenarios. The genealogy of a family is often represented by means of a tree (as a matter of fact, the term tree comes from family tree [36]), with all the main person's relatives being represented as edges that are connected, forming a hierarchical reasoning between them, in the form of links.

Several works have been made using the graph tree concept as its core asset. Neuhauser and Krone [103] in their research used a named ancestral selection graph – a graph with a coalescing and branching structure – in order to introduce the genealogy of a random sample of genes. More specifically, McGuffin and Balakrishnan [96] pointed the general problem of visualizing family trees – or "genealogical graphs" in 2D. In their work, they made a theoretic analysis which identified why genealogical graphs can be difficult to obtain and gave some design recommendations and interactions techniques, based on those difficulties. Such techniques included expanding or collapsing edges of the graph to any depth, which was identified as something that "could be used in other domains for general tree browsing, and might possibly be adapted for general graph browsing" [96]. Also, an interesting recommendation from their work pointed that it would also be useful to have graphical representations that are oriented toward higher-level groupings of individuals, such as family units. Later on, Mazza [95] made an introductory research in how the usage of structures like graphs could be arranged in order to improve visualization issues – which was more recently supported in [39]. Nonetheless, while all these works have supported the usage of a tree as a graph-derived viable method for information visualization – specially regarding family presentation – still, little is known about the applicability of this structure to social networks' mined information. SNS are organized around users. The resulting social network provides a basis for maintaining social relationships [98] and also kinship relations. Thus, a social graph can be derived and an in-depth understanding of the graph structure of these networks is necessary to design future interfaces for an SNS. However, little is known to date on how to implemented family-based graph structures on SNS.

Having the background described, we designed the *canvas* approach, where the whole family tree is presented as a graph in a single canvas. This approach provides a different mechanism of navigation, which allows the user to drag around and zoom to focus in a specific part of the presented layout (Figure 5.6). To prevent presenting a high number of relatives initially, the first view of the graph only presents first order relatives, that is sons, parents, brothers and eventually spouse.

As presented in Figure 5.6, the user's first order relatives are structured following a static organization of elements, as the parents are always positioned above the user, the brothers are arranged on the left side, the sons are disposed below the user and finally the spouse (not present in the current example) would be settled to the right of the user. Navigation within the canvas structure is made recurring to a *pan* gesture on the device's

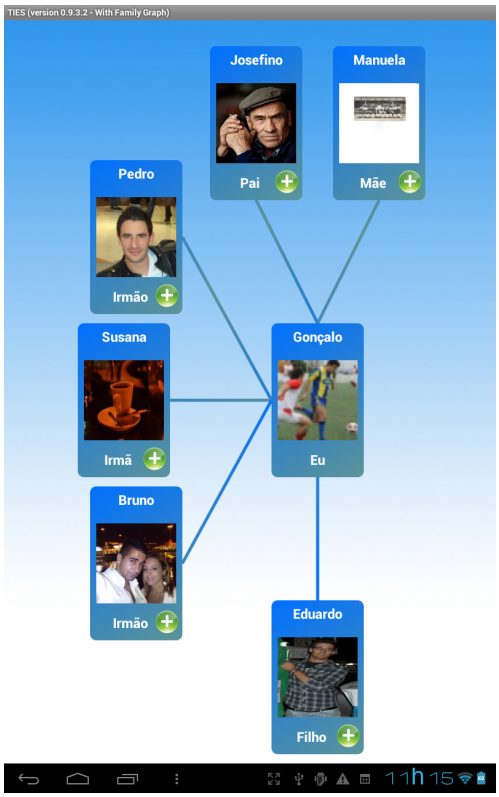

Figure 5.6: The *canvas* approach to structure the relatives

screen, which will cause the structure to be dislocated in the same direction of the gesture (Figure 5.7). Further, the user is also able to expand or collapse the relatives of any person in the graph. By doing so, the user will then be able to see which relatives derive hierarchically from the expanded one (Figure 5.8). Additionally, considering the coherence of the graph we opted to not show relatives that were already presented in the graph, thereby presenting only the 'new' ones. This is mainly justified by visualization issues, which would be risen if a link was established between each and every new family member that appears with the expansion of a relative.

For example, in the example presented in Figure 5.8, the user chooses to expand his brother and, probably, his brother's father would have appeared and be linked to the main user. But note that the user's father was already expanded (as well as other first order relatives), whereby having a connection to two different objects that represent the same relative would be incoherent. An hypothesis to suppress this would be to link the expanded relative (the user's brother, in the current example) with a relative (if existing) that shares a kinship relation both with it and the main user, which in the current example would be the father. Nonetheless, this solution also proved to not be viable due to the fact that it would overlap the existing links and relatives of the structure, which would result in a very messy design, and thus it would become very confusing for older adults to interpret the structure. Note that the newly expanded relatives present their kinship relation

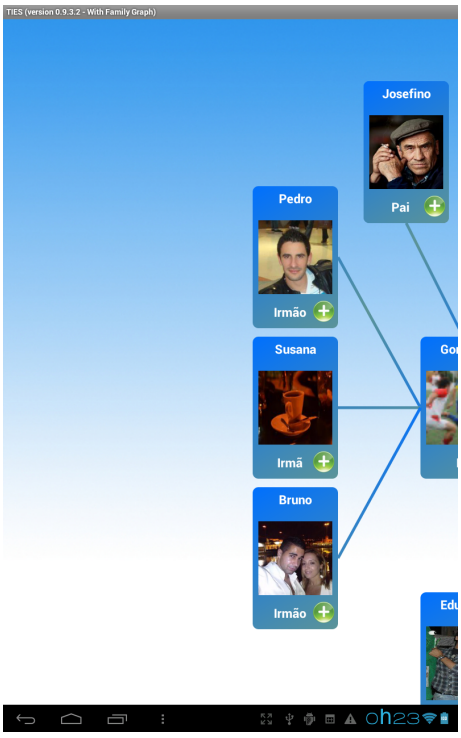

Figure 5.7: *Canvas* approach presentation after a *pan* interaction to dislocate the screen sideways, in order to have a clearer view of the user's brothers

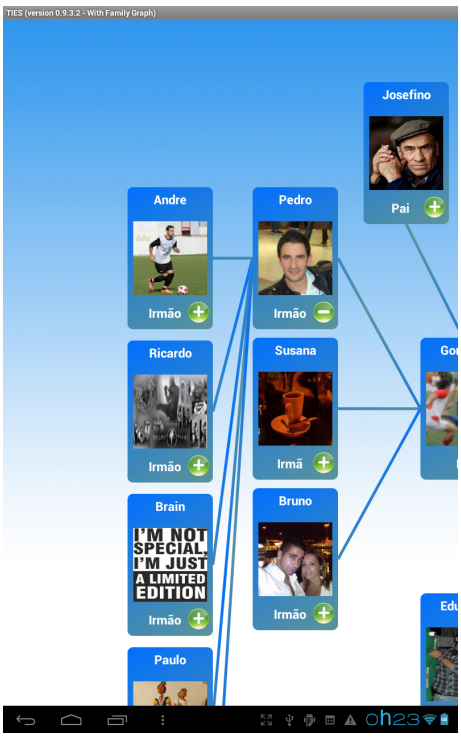

Figure 5.8: *Canvas* approach presentation after the interaction with one of the user's brothers (second level)

regarding the expanded user, and so, in the example the expanded relative's relatives have a relationship presented respecting the expanded relative.

Third Iteration: approaches comparison

As a method for assessing the viability of the two approaches, we made a comparison between them. Thus, we conducted a user study taking into account the two approaches and kinship level (close vs. distant relatives). To guide our study we have defined two extra research questions, which are described as follows:

RQ4.1: Do users prefer to see their family in the page view or the canvas view?

RQ4.2: Does the way user's prefer the kinship information to be presented (relative to them – the logged user – or to the selected relative) changes when browsing close or distant relatives?

RQ4.1 aims to understand which is the older adults' preference regarding their relatives' presentation within the SNS. **RQ4.2** considers how the distance to the relative being viewed can impact how the kinship information is presented. This research question is

grounded by the fact that it can be expected that a user can easily identify closer relatives by their kinship relative to him or herself (e.g. a son or a brother). In the same fashion, we expect that users will more easily identify distant relatives by their kinship relative to some other, closer, relative (e.g. the nephew of a cousin's son).

Procedure In each trial every participant was first inquired about age and gender, followed by questions inferring their personal opinion about tablets and Facebook, how they started using it and their interest and daily frequency of use. This short pre-survey was then followed by concrete tasks performed in each of the two prototypes: first, participants were presented with the prototype and asked to identify and navigate to a direct relative (a brother, a son or a father); secondly, they were asked to navigate to a "second-level" relative, typically an uncle or a son-in-law; and finally they were asked to navigate to a "third-level" relative (e.g. a cousin). At the end of each of the aforementioned tasks, participants were asked to comment on the lack of any assistance mechanism or unexpected behaviours. After performing the tasks in both prototypes, the participant's preference between the two presentation approaches and between kinship presentation choices was collected in a short questionnaire.

Tasks were randomised regarding which setup they used first, making sure that results would not be biased. The order of the tasks was maintained in each setup, as they gain complexity and are possible to perform in sequence. Each user-trial lasted around 15 minutes.

Participants A total of 35 people participated in our study. The participants' ages ranged from 22 years old to 65 years old (AVG = 36, SD = 11). Of the 35 participants, 9 were female and 26 were male. On average, our participants have been using tablets since one year. However, 17 of them have been using a tablet for a period less than a year. We have classified the participants' expertise using tablets based on how long they have been using them, on how often they use them, and for what kind of tasks. Our participants were much more experienced users of Facebook. On average they have been on Facebook for more than 3 years, with only one participant using Facebook for less than a year. Note that we opted to include participants from different age groups mainly due to the fact that we anticipate the usage of a component like the one presented in this research by other sets of user-population. Moreover, the obtained results were not different between age groups, and for such reason, the result's analysis considers the whole set of participants, instead of presenting it separately for each age group.

Results We now present and discuss our findings. We start with the presentation of quantitative results, collected through questionnaires. Further we will present qualitative results, which we assembled from our trial observations and debriefings.

Quantitative Analysis We begin by discussing the participants' preferences regarding how family trees should be presented. Participants were asked to select between two presentation possibilities: *canvas* approach and *page* approach. From the 35 participants, we collected 31 valid answers (the other four did not express a preference). A chi-square test of goodness-of-fit was performed to determine whether the two presentation choices were equally preferred. Preference for the two choices was not equally distributed in the sample, $\chi(1, N = 31) = 9.32$, $p = 0.002$. Participants preferred the *canvas* option (N=24) over the *page* option (N=7). Thus, we were able to answer our RQ4.1 – which aims to perceive if users prefer to see their family in the page view or the canvas view –, concluding that the *canvas* approach was the the preferred presentation mode.

We then investigated RQ4.2. RQ4.2 aims to find if the distance to the kin impact the way kinship information is to be presented. Participants were asked to select which kinship presentation possibility they would prefer from the following three choices: 1) presented relative to the authenticated user; 2) presented relative to the selected relative; 3) being able to change between the two prior options at will. They selected a presentation possibility for close relatives as well as for distant relatives.

A chi-square test of goodness-of-fit was performed to determine whether the kinship presentation choices for close relatives were equally preferred. Preference for the available choices was not equally distributed in the sample, $\chi(2, N = 35) = 43.6$, $p < 0.01$. Participants preferred kinship to be presented relative to the authenticated user (N=30) better than relative to the selected relative (N=4) or the possibility to change between these options (N=1). Similarly, a chi-square test of goodness-of-fit was performed to determine whether the kinship presentation choices for distant relatives were equally preferred. For distant relatives it was not possible to identify a preference $\chi(2, N = 35) = 5.89$, $p = 0.053$, with 16 participants opting for the presentation relative to the authenticated user, 14 for the presentation relative to the selected relative, and 5 for the possibility to change between the two prior options. These results indicate that when viewing close relatives, users prefer the kinship information to be presented relative to themselves. However, we were not able to find a clear tendency regarding browsing distant relatives, with preferences split between presentation relative to themselves or the selected relative. This does not allow us to conclusively answer RQ4.2. While a clear preference for close relatives was found, it is not clear that this preference changes when considering distant relatives.

Qualitative Analysis Regarding RQ4.1, a qualitative analysis to the results gives us several indicators that pointed that the *canvas* approach was preferred by the participants. This is also supported by some of the participants' commentaries when interacting with the prototype that used the *canvas* approach: "It is so easy to navigate in it", "Look, my relatives are all here! It is very good and pretty", "I love it! Very beautiful!".

From our observations and debriefings we can find several reasons supporting the quantitative findings regarding RQ4.2, with participants finding it easy to browse and perceive the kinship information relative to their close kin. However, we collected conflicting perceptions when the subject was distant kin, which agrees with the quantitative results collected. Some participants stated the necessity of having to somehow relate with distant relatives by perceiving the relation between those relatives and more close ones (e.g., when visualising a distant cousin they feel the necessity of knowing that that relative is a first degree cousin of their father or mother). Additionally, they stated the necessity of relating with people appearing in deepest levels of the family tree that are not their relatives (but their relatives' relatives). Other participants indicated that their preference was to have kinship information relative to them, because otherwise they felt it would be too confusing as consistency would be lost. Still, other participants would prefer to have both information at the same time or the capability of switching between information presentation options when they encounter a relative they do not recognise.

Conclusions Analysing the aforementioned results, we can draw some conclusions to guide the design of family tree interfaces. Focusing on RQ4.1, participants' responses have clearly shown that the structure that they preferred to see their relatives organized was the *canvas* approach. From the observations and debriefing we were able to perceive that this approach has gathered much greater preference when compared with the previous approach. We have also analysed the obtained results and quoted some the participants, whose commentaries give several indicators supporting the aforementioned fact. Focusing on RQ4.2, participants' responses have shown that there is a clear tendency to prefer the presentation of close kin relations relative to the authenticated user. Conversely, for distant relatives there is no clear preference regarding kinship presentation. From the observations and debriefing we could understand that a single solution is not the best solution. This results from the knowledge that, in reality, families are distinct in their structure and size. Larger families tend to have more distant relatives, which might mean that some nodes in the graph are less identifiable. For these families, we might expect users to prefer presentation relative to a selected kin. Smaller, closer families, will, on the other hand, be composed by more recognisable members. Consequently, users from these families might prefer to have every kin presented relative to them. A single solution thus would not prove optimal. A solution that changes automatically the kinship referential would also be difficult to design, since as distant relationships vary from person to person and family to family, we cannot define a level of kinship from which it would be adequate to switch the presentation.

5.2.3 Content

Following the *canvas* approach and having into account all the issues that were raised from the previous approach, we decided to rebuild the structure in order to suppress some of the visualization problems. Also, we wanted to make use of all the results obtained from the first phase (see Chapter Four), in which the users have reported to give a big relevance to media content. In addition to this, past studies have shown that people already spend a bigger amount of time consuming media content over the internet, than the amount of time spent consuming some traditional media, like television [3]. Content sharing is considered to be a great asset for many users who like to create photo books [112], or do video clustering and tagging over a social network [146], so that they can show their experience and special events to friends and family. One can think of many ways for presenting the media content made available in the most popular SNPs.

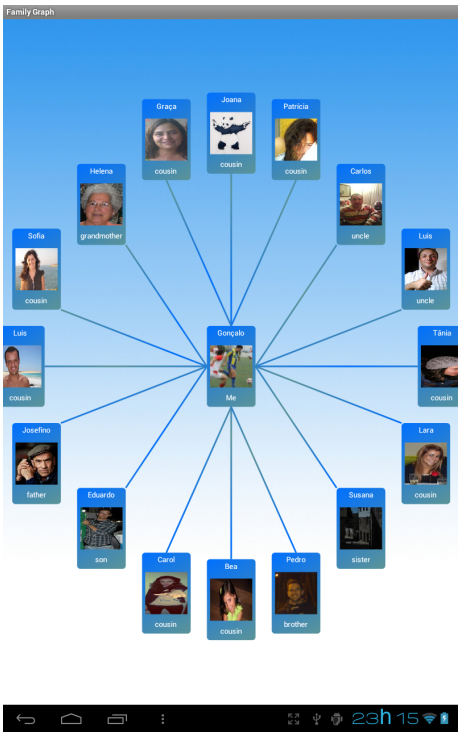

Figure 5.9: The newly implemented *canvas* approach presentation, with a wider view of the user's relatives

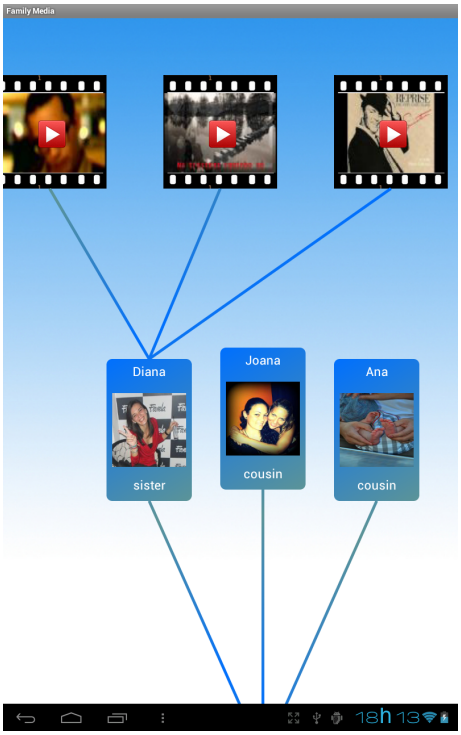

Figure 5.10: Some media content presented as a node of the *canvas* approach structure

With this in mind, we modified our previously implemented structure in order to provide support for media content. This operation had some *ripple effects* in the organization of elements and thus, the relatives' disposal around the user had a severe change. This alteration consisted in the placement of all the first (e.g. sons, brothers, spouse and parents) and second (e.g. uncles, cousins, grandfathers, grandsons, etc) order relatives around the user (Figure 5.9). With this design solution, we considered that the older adult would

have a wider perspective over his or her family as a whole. Note that for this approach, the user could still perform the *pan* gesture, which was already available in the previous approach.

We decided to make media content an important part of the *canvas* structure. Thus, we have considered that that type of content should be presented also as a 'node', within the graph (Figure 5.10). This media content represent the items that have been posted on the Facebook SNP by the relatives to which they are linked with, as can be seen in Figure 5.10. It is important to consider that the media content can be represented either by videos or images that have been posted by the user's relatives. Disregard of its type, media content would be structured around the relative that has posted it, as shown in Figure 5.11. Moreover, one of problems faced with this type of approach is the content overlapping that naturally happens as the its quantity grows. For such purpose we managed to structure the media content so that it would not overlap the other contents, resorting to a simple collision detection algorithm. Nonetheless, since that issue was not the main focus of our work, we have decided to leave aside some implementation details inherent to algorithm.

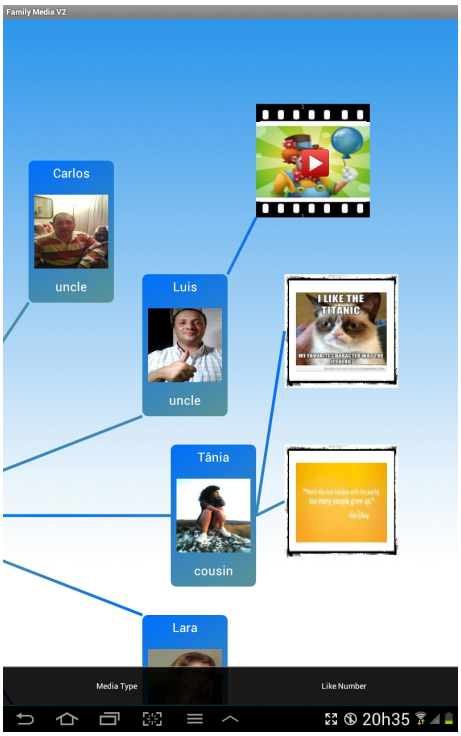

Figure 5.11: The *canvas* approach presentation, presenting media content as elements of the structure

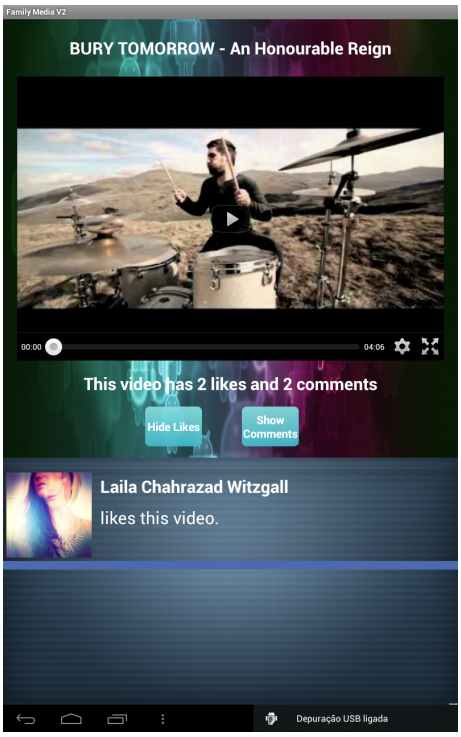

Figure 5.12: Our approach for the presentation of media content, in this case, a video

Further, the user could click the media content in order to visualize it or (in case that the content is a video) play it. In the latter case we implemented an embedded *Youtube Video Player*, using the Youtube API by Google Developers [38], such that the elderly user could have an easier experience playing the video directly in the prototype, avoiding

redirections that would probably confuse the user – which is in fact, the approach the Native Facebook Mobile Application takes. Furthermore, the user also had the chance to see which contacts have liked and/or commented his or her photo or video, as show in Figure 5.12. But this solution had a major problem, that was directly related with the fact the media content (as multiplied by the relatives that posted it) would scale to great proportions, as we have already referred. This would represent not only a challenge for the development, but also for the older adult interaction. The latter issue is related to the fact that the older adult user would probably not be capable of handling such great quantities of information and – as shown in our previous studies (see Chapter Four) – filtering mechanisms are one of their great priorities when consuming SNS' content.

With the previous set of issues in mind, we finally opted to develop a final solution that would take into account the lack of solutions to filter media content – as was inferred from the previous iteration – and would unfold that concern. Therefore we decided to develop a solution that provided some sort of mechanism to filter all the media content that was posted by the user's relatives, providing a better solution for the older adult to specify the level of granularity they want, regarding media content.

Accordingly, we affixed two additional interface components (Figure 5.13) that provide the aforementioned mechanisms. Interacting with such components would allow the older adult to filter the posted media content either by **type**, or by the **number of likes** – that the post has. Figure 5.13 illustrates this scenarios, illustrating the result of applying each filter to the posted media content.

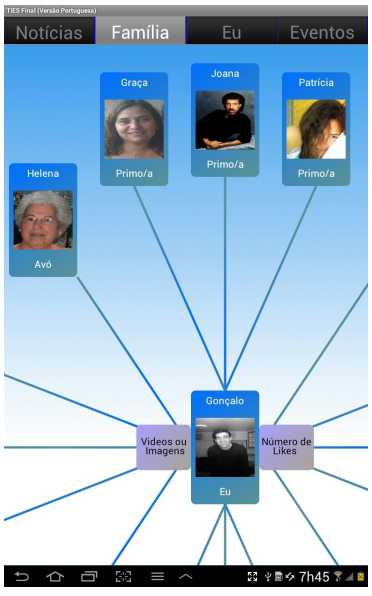

Figure 5.13: The *canvas* approach to structure the user's relatives with the inclusion of filtering mechanisms

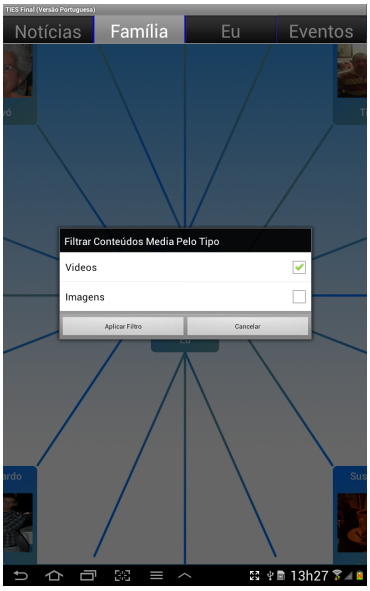

Figure 5.14: Applying the the *canvas*' filter by type of media content

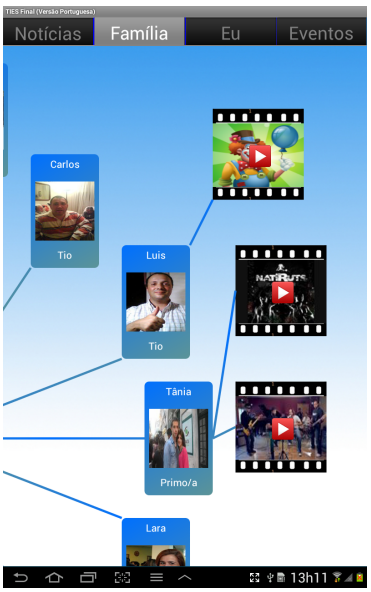

Figure 5.15: The result of applying the *canvas*' filter by media type

Figure 5.16: Applying the the *canvas*' filter by number of likes

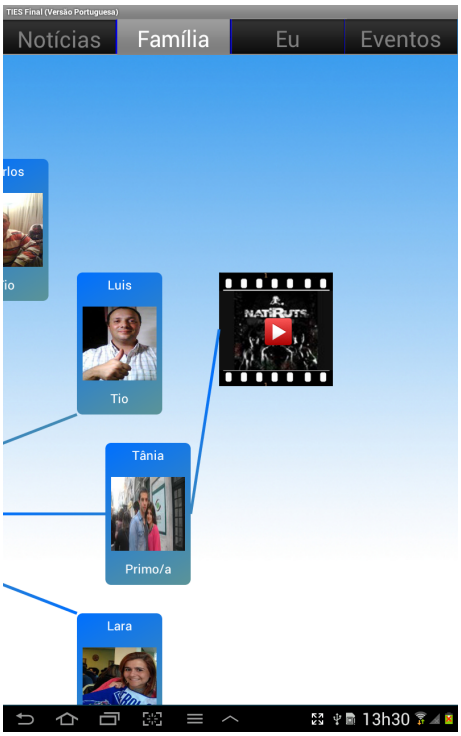

Figure 5.17: The result of applying the *canvas*' filter by number of likes

Note that when the older adult user chooses to filter the media content by its type, he or she is presented with a *dialog box* (Figure 5.14), which supports applying the filter either by **Videos** or **Images**. This would result in an interface that would provide access for the videos, as they would be a part of the graph as well (Figure 5.15). Moreover, the user could opt to visualize one of his or her relatives' posted videos or images, by simply clicking in one of those.

Additionally, and as was previously stated, we implemented a component for filtering media content by the number of likes. As the user touches the aforementioned component, he or she will be presented with another *dialog* where he or she could decided for what number of likes to filter the media content. Figure 5.16 exemplifies this scenario. This type of filter provides an improved level of granularity when visualizing media content, for it allows the older adult with a more specific view of that posted content. Figure 5.17 shows the result of filtering the posted media content, by selecting only content that has over three likes and this results in the number of videos decreasing from three to one. This reflects clearly the applicability of the filtering mechanism within the scope of our prototype.

5.2.4 Functionalities

As has been shown by senior users that participated in the user studies run in the first phase, they do not use each and every functionality in Facebook, and thus a special focus should be naturally given to the ones they use more. Meanwhile, other functionalities should be simplified or made accessible for those older adults to be capable of making the most use of those functionalities.

Events

One of the main focus of the older adult participants in the first phase of our work, was the special need to emphasize the creation and management of family events. Accordingly, we have implemented several mechanisms in order to support event management by the older adults. Figure 5.18 illustrates the prototype's main interface for event management. Following our previously methods within the prototype implementation, we have considered the development of mechanisms that would allow the older adult to see his or her own events, events from his or her family, or events that have been created by his or her friends (Figure 5.19).

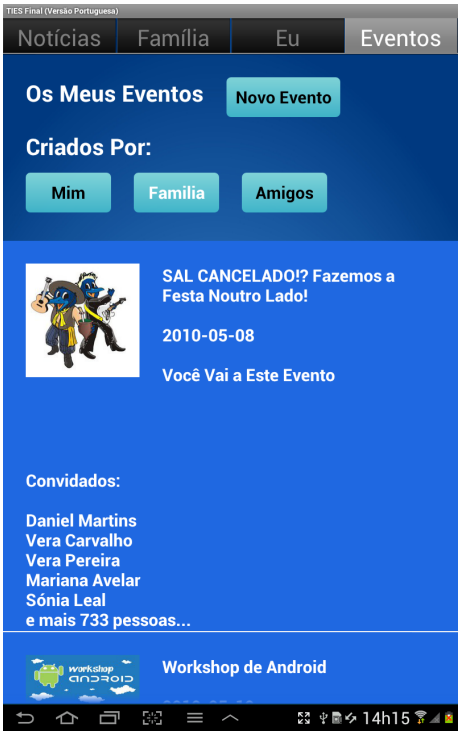

Figure 5.18: The prototype's interface for event management, with the **user's family events** selected

Figure 5.19: The prototype's interface for event management, with the **user's events** selected

Regarding creation of events, older adults could easily perform the action by selecting a button to create event ('Novo Evento'), which would result in a new *dialog*, asking the

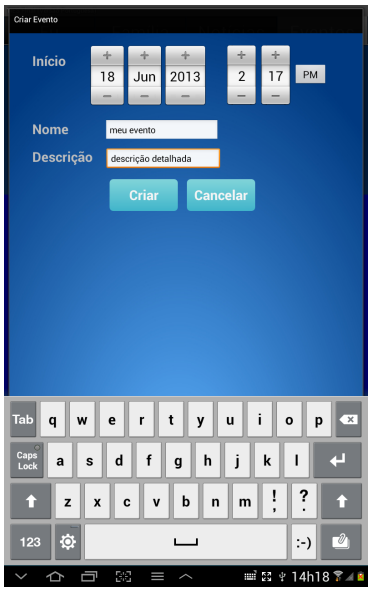

Figure 5.20: The prototype's support for user event's creation

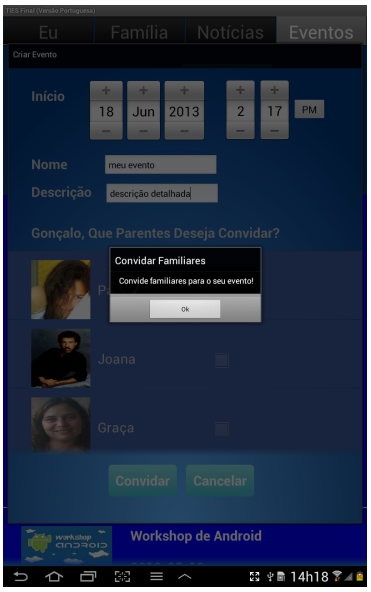

Figure 5.21: Inviting the user's relatives to a newly created event

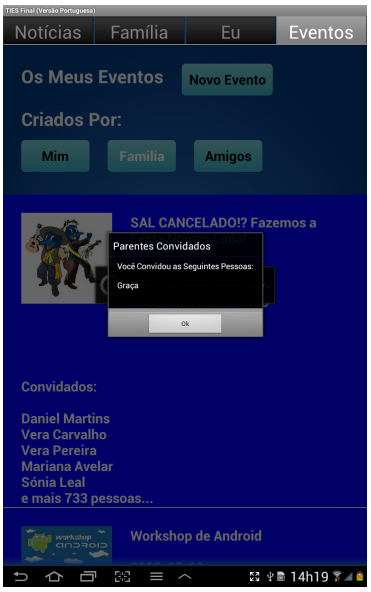

Figure 5.22: The result of creating and inviting relatives to an event

the user to introduce several useful information about the event, as the start date ('Início'), the name ('Nome'), and the description ('Descrição') (Figure 5.20). Proceeding with the event creation, the user would then be asked to invite some of his or her relatives to the event. For this purpose and in order to provide better usability, we have included a list containing all the older adult's relatives, from which he or she can select whom to invite to the event, as shown in Figure 5.21. Finally, and after choosing which relatives to invite, the older adult would receive a confirmation that the event has been successfully created, being also notified about which were the relatives that he or she just selected to the event (Figure 5.22).

As some users stated, "Functionalities related with 'friends of friends' or 'getting to know new people' should be avoided or made optional" and therefore, considering that senior users often want to use Facebook to interact with their friends, not to make new – or only virtual – ones. We ignored the implementation of functionalities like "people you might know", and we opted to keep content in newsfeed that is related with friends of friends avoided, showing only that content regarding the user's friends (disregard of the other two groups).

5.2.5 Interface

Lastly, our results from the first phase have shown that the Facebook interface is still too complex for older adults. Special interest goes for the use of non-native language and the extreme need of simplifying the general interface preventing users from getting lost while using it.

Figure 5.23: An example of the prototype's interface, showing the user's profile and using a simplification of terms and ease of navigation

Figure 5.24: Another example of the prototype's, showing the user's event management *lobby*

Participants in the studies have indicated that the Facebook interface should provide "safe points". This is mainly justified by the fact that for seniors, the current interface is too confusing and often leads them to situations where they somehow feel lost and do not know what actions to perform. Also, our studies have provided indicators that show that the interface leads to several mistakes, as for example, users posting content that is originated from standard status messages (e.g. "Write something"). In order to optimize the user interaction, the interface should be more simple and with less buttons and less functionalities. Thus, the interface should be focused around operations which are mainly performed by seniors. Moreover, the interface should also be constant, and layout changes should be highly avoided and progressive, that is users should not be obligated to change abruptly every single time that a new update is made. Finally, "safe points" like a "home" page or an identified profile page, should be made easy and obvious to access every time a user feels that he or she is lost within the application. We have considered the aforementioned issues and thus developed the main layout structure of the prototype based on a tabbed approach (Figure 5.23).

Finally, recommendations from our studies have revealed that the Facebook's usage of non-native language interface terms and content should be avoided, regarding the senior

user-population. In order to suppress this problem, we made a simplification of terms and also considered only the usage of terms that were in the native language of the users. Figure 5.24 shows one of the prototype's layouts – concretely the event management *lobby* – that took this issue into account, and in which we can see that some terms, as the button for the creation of an event, that is labelled as "'Novo Evento" ("New Event"), or even the inclusion of tabs that clearly indicate from whom the user's events are being seen – the user (labelled "Mim"), the user's family (labelled "Família") or the user's friends (labelled "Amigos").

5.3 Summary

In this chapter we have described the second phase of our work minutely. We started by making a reference to the results obtained from the previous phase – from which we have acquired several participants' suggestions from the user studies, regarding usability and accessibility of the Facebook SNS for the elderly. Such results were then used and derived in the form of recommendations for the design of a Mobile SNS for the older adults. We have managed to detail those recommendations using the same categorization used in the previous chapter (Chapter Four), for we have explained in detail which design decisions were taken into account in this phase, for each concerning topic. A special emphasis was given to the family topic. Here, we have entirely described the several approaches considered in the different iterations from which the prototype has passed, regarding the development of a structure for the older adults' genealogical tree presentation, as well as the comparison between those approaches. We have also concluded that older adults often prefer the kinship information of their relatives to be presented regarding them, instead of presented regarding the relative that they are considering. Finally, we have managed to perceive that the interaction with the *canvas* approach is greatly privileged by older adults, since it provides a greater ease of interaction when contrasting with the other considered approaches.

Chapter 6

Assessing the Design of a Facebook Interface tailored for Older Adults

In this chapter we describe the part of our work that has mainly focussed on user studies which were made in order to evaluate usability and accessibility aspects regarding the older adults' interaction with the Facebook-based prototype and the Native Facebook Mobile Application. We start by delineating our objectives with this phase, further describing our user studies, which compare the tasks performed by the participants in both applications. We describe the procedure and fully characterize the participants. Then, we present the results and make reference to our quantitative and qualitative analysis. Lastly, at the end of the chapter we discuss the main findings of this phase of our work.

6.1 Objectives

The aim of the work stage that is reported in this chapter was to assess the interaction of older adults' with both the prototype – developed in the previous phase of our research – and the Native Mobile Application of Facebook. Our assessment is made regarding both quantitative and qualitative metrics: the former considered concretely the ease of interaction that participants perceive when interacting with both applications, as well as their perceived usefulness of each task performed, whereas the latter was based on the analysis of the direct observation of participants' interaction and debriefing. Such metrics were then recorded and posteriorly analysed by us. Such analysis sheds light into the straight comparison of both approaches, providing us with several indicators of which solution better supports the older adults' requirements when interacting with the Facebook SNS.

Accordingly, this third phase of our work seeks to answer the fifth research question:

- RQ5: Can an interface built following the previously obtained recommendations be more attractive for older adult users than the actual Native Facebook Mobile interface?

6.2 Procedure

To assess the effect of the recommendations which were obtained as described in Chapter Four, we conducted a user study where we compared Facebook's Android native application and the prototype designed according to the design recommendations. We started by presenting to the trial participants our work and goals of the study. Participants were then asked to perform 9 tasks in both Facebook's native application and our prototype. The order of presentation of the two applications was alternated, with half of the participants performing the tasks first in the Facebook's native applications and the other half in our prototype, in order to avoid bias of participants' reactions and responses. Further, we grouped the tasks into five distinct groups, with these being representative of the most relevant features stated by the participants, in studies made in the first phase of our work (Chapter Four): **posting tasks**, **find contacts that shared a kinship relation with them**, **content presentation**, **content filtering** and **event management**.

To make sure the selected tasks were representative of real usage of Facebook's services, we asked the participants, for each task except the first one (Login), to describe a real usage scenario in which they would use the feature the task was requesting them to use. Overall, participants' responses were uniform. They often want to share messages to only a selected group within their contacts (second task). Participants also stated that they use the SNS to see news updates, especially regarding their relatives, as well as seeing their profiles (third, fourth and fifth tasks). One of the reasons that participants used to justify their tendency to want to see their family in the SNS, is the fact that they usually love to see photos and interesting videos they have posted (sixth task). Lastly, it was curious to see that every participant was in accordance when answering the question "What would you like to say to your family?", since all responses showed that participants are often worried about inviting their relatives to events they want to organize, but do not know how to broadcast the message (seventh, eighth and ninth tasks).

After each task, participants were asked to qualify the task according both to its difficulty and usefulness, on a scale from 0 (lowest) to 5 (highest).

We considered that since this stage of our work represented an exploratory phase, a qualitative analysis would be much more valuable than a quantitative one. A quantitative analysis was still taken into account, even though less relevance was given to it. Taking this into account, and considering the difficulties and lack of time to canvass older adults for the user studies that were performed, we settled for a total of 10 participants. Also, we decided to not record times of execution and error rate for each task. This is mainly justified by the the fact that our studies were made with older adults in a relaxed environment, in which the participants were often interacting with the moderator – as described by our participant quoting – and thus, recording such metrics would probably lead to values that would not be representative of the participants efficiency and effectiveness.

6.3 Participants

The study was conducted both in an Senior Nursing Home and a Senior University, with 10 different participants, which in turn were not the ones with whom we conducted the studies reported in the first phase of our work (Chapter Four). Every participant that participated in this phase of our work already had a Facebook account, but they had never used Facebook's native application on a mobile device. The average age of the participants was 72 years old, with the oldest participant being 81, and the youngest one 67 years old. We have also asked the participants what was their frequency of use of the Facebook SNS, recording values in a scale from 0 (rarely) to 5 (frequently). As illustrated by Table 6.1, only one participant was not frequent user of SNS. Seven out of ten participants stated they used the SNS to see news about their friends and family. Eight out of ten participants stated he or she feels that SNS provide a feeling of closeness to his or her family, mainly by providing easy means of communication. Quoting some participants: "...if Facebook lets me talk to my sons, then i feel close to them!", "Sure! It is easy to see my family this way!".

Participant No.	Age	Gender	Frequency of Use
1	76	male	3
2	70	female	4
3	68	male	3
4	81	male	1
5	69	female	3
6	81	female	4
7	68	male	3
8	72	female	3
9	67	male	3
10	72	male	4

Table 6.1: Participants' characterization. The frequency of use's scale range from 0 (lowest) to 5 (highest).

6.4 Results

Table 6.2 presents an overview of participant's perceived task easiness, in both native application and prototype, and usefulness. As can be seen, tasks in the prototype were perceived to be easier to perform. With the exception of reading the newsfeed, all other tasks were notoriously easier to perform with the prototype. This is particularly relevant, given that tasks were focused on the features that seniors attribute bigger importance for using a social network. Strengthening this, is the fact that all tasks, and therefore, all functionalities associated to them, were considered useful. In the following section we

Task		Easiness		Usefulness
No.	Description	Native App.	Prototype	
1	Login	-	-	-
2	Post to wall	1.9	4.9	3.7
3	See newsfeed	3.9	4.9	4.6
4	See family	0.2	4.4	3.9
5	See family feed	1.2	4.0	3.5
6	See media feed	0.3	3.4	3.1
7	See events	2.2	4	3.4
8	Create event	1.9	4.5	3.5
9	Uninvite from event	2.6	4	3.7

Table 6.2: Average subjective easiness in both the native application and prototype, and perceived usefulness for each task. Scale range from 0 (lowest) to 5 (highest).

present a quantitative and qualitative overview of these results, from the trial's observation and participants' comments.

6.5 Analysis

6.5.1 Quantitative Analysis

Considering a quantitative analysis to the results obtained in the third and last phase of our work, we have managed to analyse the results. This subsection sheds light to the values – regarding easiness and usefulness – that were obtained from the participants interaction with both solutions.

Figure 6.1 illustrates the discrepancy of quantitative results, regarding the tasks performed in both approaches – with the exception of the first task, the Login, from which we only recorded the participants' reaction to the solution, reported in the next subsection. The graph represents the average of results presented previously in Table 6.2, in which the values are accounted from 0 (very hard) to 5 (very easy). From such illustration we can see that when asked to **share** something to their contacts, participants have felt greater easiness performing the task in our prototype (4,9 out of 5 points, average), when contrasting with the Native Application (1,9 out of 5 points, average).

Further, **reading the newsfeed** was considered an easy task to perform in both approaches, by the participants. Even so, participants have felt greater ease of interaction when performing the task in the prototype (again, 4,9 out of 5 points, average), rather than when performing the task in the Native Application (3,9 out of 5 points, average). This value closeness – contrastingly to the previous results – can be justified by the fact that the participants are first presented with their newsfeed, when accessing their account via Native Facebook Mobile Application. Moreover, participants have considered this task as

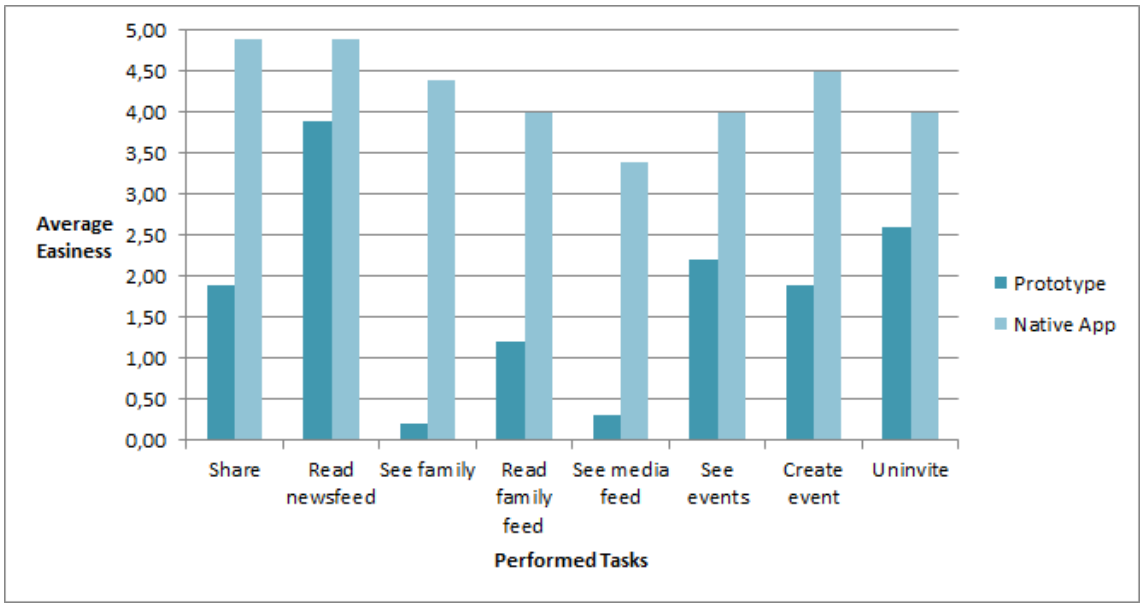

Figure 6.1: The graph of participants' perceived **usability** regarding the user studies' tasks

one of the most important for them, as suggested by Figure 6.2, with the task obtaining 4,6 out of 5 points (average).

The task in which the participants have reported more difficulties performing in the Native Application was the fourth, that asked them to **see their family**. As shown in Figure 6.1, we can observe that there was a huge difference between the easiness of performing the task in the two applications. There was a clearer ease of interaction being reported by participants when performing the task in the prototype (4,4 out of 5 points, average), contrasting with the difficulties reported in the Native Facebook Mobile Application (0,2 out of 5 points, average).

When asked to **read the family feed**, participants have reported a greater ease of interaction performing the task on the Native Application (1,2 out of 5 points, average), comparing to the previous task. Still, this result is clearly representative of the challenges that the participants have felt when interacting with the Native Application, and this becomes more notorious when comparing the numeric results with the ones obtained in the prototype (4 out of 5 points, average). Also, accordingly to our previously mentioned research, we have obtained quantitative results that show that this family features are regarded as important for the older adults, as has been suggested (Figure 6.2).

Moreover, **seeing the media feed** was also a task in which the participants have felt great difficulties, when interacting with the Native Application (0,3 out of 5 points, average). Further, this task has been easily performed in the prototype by the participants (3,4 out of 5 points, average). This value is a strong indicator that the Native Facebook Mobile Application has no usable support to filter the media content that is presented in the users' newsfeed.

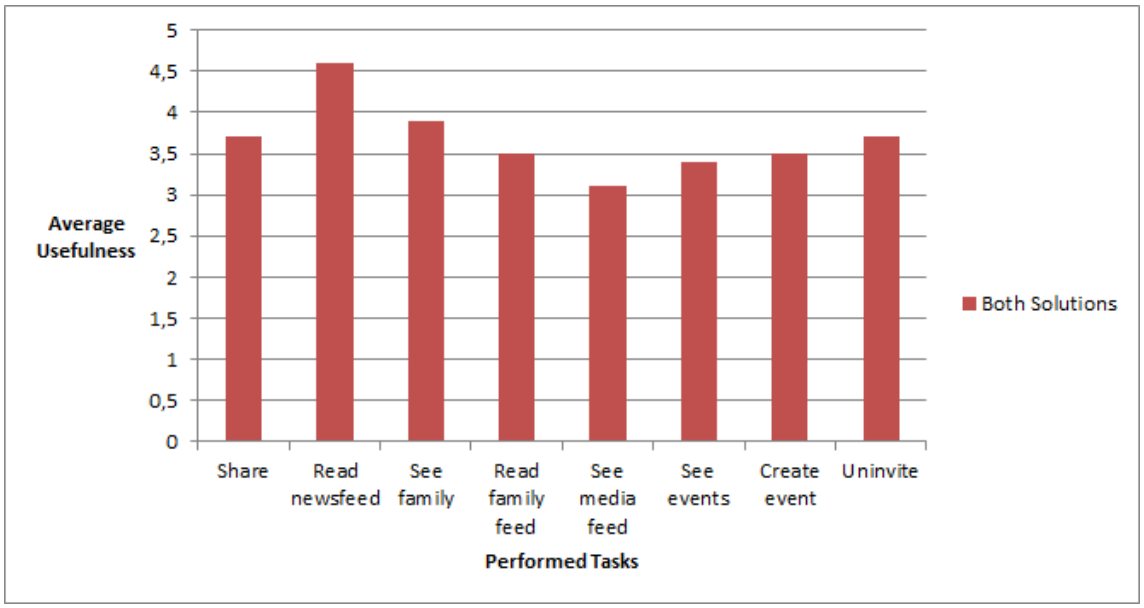

Figure 6.2: The graph of participants' perceived **usefulness** regarding the user studies' tasks

Further, **seeing events**, **creating events** and **uninviting contacts from events** were tasks in which the participants have also reported a greater ease of interaction in the prototype, with this approach obtaining about 2 more points (out of 5, average) in each of the aforementioned tasks. Also, Figure 6.2 clearly shows that the participants have considered this type of functionalities very useful, with the three tasks that comprehended event management activities having around 3,5 points out of 5 (average).

6.5.2 Qualitative Analysis

Considering a qualitative analysis to the results obtained in this last phase of our work, we can divide the results into five distinct groups, as we stated section 6.2. The groups are directly related to the way we grouped the study tasks: **posting tasks**, **find contacts that shared a kinship relation with them**, **content presentation**, **content filtering** and **event management**.

Results from the user studies have shown good support for us to consider that the Native Facebook Application requires some interface improvements, considering the design recommendations in which we focused in. Participants' initial reaction to Facebook's Native Application interface revealed some confusion. This was due in part to the large amount of information that was presented in the interface – note that the first screen presented in the native application is the news feed. Some of the participants' reactions were "What is this? This looks different from the computer version!", or "I do not even understand this! I will not touch it!" Contrastingly, participants' reaction to our Facebook-based prototype revealed enthusiasm for the contents presented (their profile), as commentaries

shown: “Oh look, it is me, so cute!” and “This is so beautiful! How did you do it?”

When faced with the **posting tasks**, participants revealed a much greater efficiency when performing them on our prototype. When using the native application’s interface, not a single participant could easily find the right way to post a message on his or her wall. In addition, after finding out how to post a message, participants were not able to understand how to configure the privacy of the post itself. Some participants’ most relevant commentaries supported those facts: “Where do I find it?” or “Where do I change the target audience of the post?! I cannot find it”.

We obtained similar results regarding tasks in which the participants were asked to **find contacts that shared a kinship relation with them**. Participants revealed great difficulty when searching for their relatives within the native application. This was due to the fact that in order to see his or her family, participants had to first click the top-left corner button, which, as some participants stated, gives no clue about its functions. After clicking the button, participants had to cycle through a big list, in order to finally see their family. As a result, only two participants found it not hard to perform the task in the native application, with the remaining participants considering the task hard to perform. Some participants even considered the task “impossible” to perform “if not assisted” by the user studies moderator, as some of their statements have shown. For the prototype every participant acknowledged the task as being very easy to perform.

Considering tasks related with **content presentation**, after the difficult task of discovering how to see their family, participants found it easier to browse the contents shared by their kin in the native application. This can be expected, since that is the content presented after selecting the family group in the options menu. Likewise, on the prototype, participants found it easy to search for their family’s activity, since they only needed to select the “News” tab, which opens up by default to the family newsfeed. Participants stated the task was “very simple to perform”.

When considering **content filtering**, every participant found difficulties when interacting with the native application. This was due to the fact that the native application does not possess any media content filtering mechanism, which makes the task “very hard to perform”, as some participants stated. Likewise, on the prototype, participants have revealed some difficulties when performing the aforementioned task. Some of them stated that since they were already presented with their newsfeed they expected it to provide some filtering mechanism in order to easily find different media content. Nonetheless, after finding out that the media content filtering mechanism was embedded in the family graph, participants considered the task very easy to perform, mainly due to the “information disposition” and “ease of interaction”.

Regarding **event management** activities, participants felt great difficulties when interacting with the native application. This is explained by the fact that the process to find user’s events within the application is analogous to the one required to find the partic-

ipant's family: the participant had to click the top-left corner button, and then wander through a big list, such that he or she could finally see his or her events. In addition to this, participants were not able to easily find out which events had been created either by them or their contacts, since (as some of them stated) the information was "too confusing". Moreover, creating an event revealed to be a complicated task for some participants, when using the native application. This results from the 'create event' button being represented as a '+' signal, which gave no notion of its main functionality to our participants. Contrastingly, on the prototype, participants revealed great ease of interaction with the interface. They were able to freely see all of the events from different sources, as well as creating events of their own. Some of them also stated that the event management was "very easy", since the buttons are "very well labelled". Additionally, participants were easily able to uninvite contacts from their own events.

6.6 Discussion

Social networks have the potential to mitigate social isolation problems felt by seniors worldwide. However, currently, the social networks which support the largest number of users, do not cater for the requirements of older adults. We have developed several elicitation activities that allowed us to identify a set of design requirements for social networks that aim to address these concerns. We found that privacy, and a big focus on family related content and activities are paramount for senior users.

We conducted a user study, comparing the current native Facebook application for mobile devices with our prototype. Results from the user study show that senior users experience several difficulties when performing family related tasks in Facebook's native application. On the other hand, with our prototype designed according to the elicited recommendations, they were able to easily complete most of the requested tasks, revealing high levels of satisfaction. Consequently, we have preliminary indications that our design recommendations do contribute to improve the usability and accessibility of social networks, which can lead to improving seniors' quality of life.

Results from our user studies have shown that there are several issues to be considered in order to improve the native Facebook application, to make it more usable by the senior population. Participants' initial reaction to Facebook's Native Application interface revealed some confusion. This was due in part to the large amount of information that was presented in the interface – note that the first screen presented in the native application is the news feed.

Our quantitative analysis has shown that tasks in the prototype were much easier to perform, with usability results revealing a great discrepancy when performed in the prototype, in contrast with when performed in the Native Facebook Mobile Application. With the exception of reading the newsfeed, all other tasks were notoriously easier to perform

with the prototype. Another indicator of this is the fact that all tasks, and therefore, all functionalities associated to them, were considered useful.

Moreover, our qualitative analysis to the results obtained in the studies, have also shown that the tasks were much easier to perform in the prototype. This has been mainly supported by the participants' quotes and reactions when interacting with the Native Application: "Where do I find it?", "Where do I change the target audience of the post?! I cannot find it" – when trying to post something in his or her wall; "'This is impossible!" – when trying to find contacts that had a kinship relation with him or her; "Without help, I will not be able to do it!" – when trying to find and filter media content presented in his or her newsfeed.

Summarising, there was a straight concordance between qualitative and quantitative results. Every task to which the quantitative results pointed as being easy to perform in the solutions, have also been quoted by the same participants as being "easy to perform". Moreover, the metrics that were applied to measure the task's usefulness demonstrate that the functionalities and the focus that was given to the prototype is the correct one, for this set of user-population.

Thus, we have considered as main findings and outcomes of the user study performed in this phase of our work, that a prototype that was design under the recommendations derived previously in our work, is more adequate to the elderly population than the Native Facebook Mobile Application. Some crucial aspects provided by the prototype include facilitating the interaction and potentiating activities that allow users to post messages to a directed and determined group of users. Also, this type of action was made available in order to provide the same mechanism for older adults to easily post content to their family, assuring that the user is granted the required privacy. Moreover, there was large focus onto family activities, such as granting the access of user to his or her family.

The family presentation was also an interesting point in which we brought insight, since results have shown that participants of our study feel great affinity by the type of interaction provided by the graph structure that was used in our prototype solution. Therefore, we suggest the inclusion of this type of structure in the Native Facebook Mobile Application, providing the older adults with a clearer view over their family members, as well as a greater user experience when navigating their genealogical tree.

Also, given our study results, we have strong indicators that there should be an additional support for the promotion of the users' family posted media content. This becomes crucial if we take into account that the Native Facebook Mobile Application has no real support for content filtering. Thus, without such mechanism, there is a clear challenge for older adults – and users in general – that might probably want to visualize their contacts' posted media content.

Lastly, our results have pointed out that event management activities should also be fostered, since as our user studies' participants have stated, events "allow the grouping

of family members" and therefore "support closeness to family". This is also a critical issue that has been considered and implemented in our prototype solution. Contrastingly, the Native Facebook Mobile Application has not a usable support for event management. Moreover, the Native Facebook Mobile Application also does not provide the users with the options to invite a specific group of contacts to their newly created events. This represents a challenge for older adults who have reported that would mainly use the event management mechanisms in order to invite their relatives to family events.

6.7 Summary

In this chapter we have described the part of our work that has focussed on the evaluation of the older adults' interaction with both the Facebook-based prototype and the Native Facebook Mobile Application. To this end, we have conducted studies in order to understand the easiness and usefulness metrics, regarding the older adults' interaction with those solutions. Further, in this chapter we have managed to compare the tasks performed by the participants in both applications, using a qualitative analysis, which was then discussed in detail at the end of the chapter.

As main findings and outcomes of these phase, we considered the recommendations that were derived in the previous phase and implemented a Facebook-based prototype, in order to provide a better interaction and user experience for older adults. By comparing these prototype with the Native Facebook Mobile Application, we have made an evaluation and managed to perceive several aspects regarding the suitability of the prototype for older adults. Some of those aspects include facilitating the interaction and potentiating activities that allow users to post messages to a directed and determined group of users. We also suggested the inclusion of a structure in the prototype solution that provided older adults with a clearer view over their family members, as well as a greater user experience when navigating their genealogical tree. Moreover, we have strong indicators that there should be an additional support for the promotion of the users' family posted media content. Moreover, the Native Facebook Mobile Application does not provide the users with the options to invite a specific group of contacts to their newly created events. This represents a challenge for older adults who have reported that would mainly use the event management mechanisms in order to invite their relatives to family events, and thus we suggest the inclusion of such mechanism.

Chapter 7

Conclusions and Future Work

The overall aim of this research was to advance the understanding of older adults and their limitations and preferences when interacting with the Mobile Facebook SNS, in order to provide recommendations that would help the design of an improved Mobile Facebook SNP – specifically for tablet devices. More specifically, we aimed to: (1) investigate the older adults' challenges and preferences when interacting with the Native Facebook Mobile Application; (2) perceive how the older adults' preferences when interacting with the Native Facebook Mobile Application could result in suggestions for the improvement of that same SNP; (3) translate such suggestions in the form of recommendations for the design of a Mobile SNS that suits the older adults' requirements and focuses the user population's characteristics; (4) use such design recommendations to design a Facebook-based prototype that provides an improved interface, focusing the older adults' interaction with the SNS; (5) compare the older adults' user experience with both the developed prototype and the Native Facebook Mobile Application, in order to obtain several usability and accessibility indicators.

7.1 Summary of Findings and Conclusions

In this section, we will present a summary of our main findings and conclusions according to each of the research questions that were already presented in Section 1.4.

- **RQ1**: What are the main activities an Elderly user wants to perform in Mobile SNS?

- **RQ2**: What are the main challenges of Elderly users when interacting with Mobile SNS?

  Our literature revision identified that even though there are several barriers that limit the consequent bridging between older adults and new technology [30, 133], those barriers can be overcome by designing products that better meet the elderly needs and expectations, contradicting that tendency. Also, this can be achieved by

providing several environments in which the older adults can better interact with ICTs, thus providing a positive experience within that context [30, 149].

Further, our research has also shed light into the fact that mobile devices have also received an increasing amount of attention as platforms for developing specialized applications regarding the needs of the elderly population [24, 72, 87]. Specifically, such applications allow older adults to maintain social relationships and monitor their health, while maintaining independence by continuing to live in their own homes [111].

Finally, our research has revealed that older adults increasingly feel the need to have contact with new technologies, as these are being mainly designed to support an active life [85], and that several recent studies show that the usage of platforms like Facebook, by allowing frequent, light and collective discussions with close family [88, 115], increase well-being and life satisfaction [130], and reduce isolation [17].

Accordingly, in the first phase of our research (Chapter Four) we managed to understand what were the main activities that older adults want to perform in the Mobile Facebook SNP. Our main findings from this phase revealed that older adults desire to perform several actions which are directly related with a set of behaviours. **Privacy** – which as has been revised in our research, is one of the main concerns of general Facebook users [122, 109] –, as older adults feel the difficulties understanding where they can be able to configure privacy settings on the Mobile Facebook SNP. In this phase of our work, it also has been revealed that older adults prefer a **group focus** – instead of individual –, as well as the **focus on family** and family-related functionalities, in concordance with our literature revision, that revealed that family plays a fundamental role in the older adults' lives [119, 121]. We also find that in concordance with past works' findings [3], the Mobile Facebook SNS lacks a proper mechanism for media **content filtering**, since older adults often like to see videos and photos from their relatives. But still they find it hard to filter such type of content throughout such massive information, as the one presented in the Facebook newsfeed. Moreover, we have found that older adults often privilege some **functionalities**, such as communicating with their contacts via chat, or playing games. Nevertheless, our findings have also revealed that these users do not want to perform these activities with people that they do not know. Finally, we have discovered that the Mobile Facebook **Interface** is too complex for the older adults, and that this user-population normally feels that they are "lost" in the application.

- **RQ3**: What are the main requirements for an SNS mobile interface targeting older adults?

  During the literature review, we found that older adults still cannot make use of social networks as these are simply not designed for them [130]. Accordingly, in our

first phase we have obtained several suggestions from the user studies' participants – regarding the activities and challenges of interaction that older adults have when interacting with Mobile SNS, which were already discussed above. Such suggestions have reflected the participants' desired behaviours and challenges of interaction. Further, we have managed to find a set of recommendations for the design of a Mobile Facebook-based prototype. Such recommendations have pointed to six crucial aspects: privacy, groups, family, content, functionalities and interface. Regarding each one of these aspects, we have now good indicators that a Mobile SNS that suits the elderly requirements, must have into account privacy concerns and their accessibility, as well as focusing on family-based and group-based functionalities. Moreover, there should also be a focus on content presentation and filtering, with special concerns regarding interface aspects.

- **RQ4**: How can the older adult accessibility recommendations be designed into a Mobile SNS?

  Our literature review has revealed that Facebook is the most active SNS worldwide, having an average of 552 million users active daily [48]. These users are constantly generating contents, interacting and consuming contents within the SNP [6]. Accordingly, we have managed to take into account the set of recommendations that were obtained in the previous phase of our work (Chapter Four), in order to build a prototype that would serve the older adults' requirements when interacting with Mobile SNS. Thus, our findings from this phase comprehended an insight into several aspects which relate to the development of a Facebook-based Mobile interface. A special emphasis was given to the family topic, regarding which we have managed to iterate three times, in order to decide between design approaches to structure the older adults' relatives. We have also concluded that older adults often prefer the kinship information of their relatives to be presented regarding them, instead of presented regarding the relative that they are considering. Finally, we have managed to perceive that the interaction with the *canvas* approach is greatly privileged by older adults, since it provides a greater ease of interaction when contrasting with the other considered approaches.

- **RQ5**: Can an interface built following the older adult accessibility recommendations be more attractive for older adult users than the actual Native Facebook Mobile interface?

  In the last phase of our research we have found that – resorting to user studies, described and detailed in Chapter Five – that a prototype built under the derived recommendations, has a greater acceptance and provides a greater ease of interaction for the older adults, than the Native Facebook Mobile Application. Such findings were supported by older adults who participated in the user studies – performed

within this phase of our research –, who have revealed to be capable of performing every task proposed more easily in our Facebook-based prototype.

7.2 Contributions

The research that was performed in the context of this thesis results in a number of contributions. Such contibutions include the findings of the three phases that comprehended our work, that were already mentioned and described. The **first phase** of research allowed for a better understanding regarding the activities that older adults want to perform the most, when interacting with Mobile SNS. Also, this phase provided an insight into the main challenges that older adults have when interacting with the same Mobile SNS. Lastly, from this phase we have unveiled a set of recommendations that could be successfully used for the design of a Mobile SNS, that focuses the older adults' needs and expectations. Additionally, the **second phase** of research contributes to the knowledge about how can the recommendations for the design of a an interface that better suites the elderly requirements, be translated into the detailed design of a Facebook-based Mobile interface, for a Tablet surface, running an Android operating system. Further, this phase have contributed with several iterations of such interface, which can be used to further enhancement, regarding the older adults' interaction with Mobile SNS. Finally, research **phase three** has contributed to obtain a comparison between the Facebook-based prototype, and the Native Facebook Mobile Application, regarding the older adults' ease of interaction. This comparison helped to further understand – by performing tasks that are representative of actions they would like to perform in real life – how easily the older adults can interact with an application that suits their requirements and the behaviours that they value the most.

In sum, the three phases of our research allowed for (1) a better understanding of the older adults' most performed activities and challenges, within the context of the Mobile SNS, as well as a set of recommendations for the design of a Mobile SNS for the older adults; (2) perceiving how recommendations for the design of a Mobile SNS can be translated into the development of a Facebook-based prototype that focuses the elderly requirements; (3) comparing the older adults' interaction with the Facebook-based prototype – that was built under the aforementioned recommendations –, with the Native Facebook Mobile Application.

Lastly, our work within the scope of this thesis also originated several research publications. Two of those were made when the first phase of our work was being performed, whereas the other was made in the last phase of our work:

- Gomes, G., Matos, E., Coelho, J., Duarte, C., *Family Tree: Motivator for Elderly Adoption of Social Networks*, CHI 2013 Mobile Accessibility Workshop, April 27 – May 2, 2013.

- Gomes, G., Coelho, J., Matos, E., Duarte, C, *Estudo de uma nova Interface para o Facebook centrada em utilizadores idosos*, Submitted for publication at INTERAÇÃO '13, 2013.

- Coelho, J., Gomes, G., Matos, E., Duarte, C, *A Survey About Media Content Consumption in Social Network Platforms*, Submitted for publication at INTERAÇÃO '13, 2013.

Additionally, one more research work was submitted for publication, and are waiting for review results at the time of writing:

- Gomes, G., Coelho, J., Matos, E., Duarte, C, *Studying Family Tree Presentation Issues on Facebook*, Submitted for publication at GRAPP '14, 2013.

7.3 Future Work

Our research revealed that the current Native Facebook Mobile Application is not not immediately usable by older adults. In many cases, they do not have a clue of where (in the application) they can perform their desired activities, and therefore demonstrate several difficulties performing those activities (see Section 4.2 for further detail). Thus, we have discovered that the the range of actions that older adults often want to perform in the scope of a Mobile SNS, can be mapped into a several grouped behaviours (see Section 4.3 for further detail on the results). Those behaviours were then derived into the form of recommendations for the design of a Mobile SNS, and accordingly, we managed to develop a Facebook-based prototype for Tablets, that focuses on the older adults' desired behaviours (see Section 5.2 for further details regarding the prototype). Further, we used the developed prototype to compare its usability (older adults' level of satisfaction, concretely easiness and usefulness) against the Native Facebook Mobile Application (see Section 6.2 for further details). We have then managed to unveil that the prototype provides the older adults with easiness of interaction – regarding the tasks that they often want to perform in Mobile SNS –, contrasting with the Native Facebook Mobile Application, in which the older adults feel serious difficulties performing their desired behaviours, mainly due to the interface limitations (see Sections 6.4 to 6.6 for further details on the user studies' results).

However, some issues in our approaches can still pose limitations to the sharpness of the results. As future work, it would be interesting to compare the older adults' usability with a larger number of participants, since the number of participants in the last phase of our work was somehow limited. Also, we plan to conduct our future studies with a more broader scope of context, comparing the older adults' interaction not only between our Facebook-based prototype and the Native Facebook Mobile Application, but also with

the Desktop version of the Facebook SNS. Finally, we plan to make use of more specific and accurate measures of usability – including efficiency and effectiveness –, and also perform a more complete study – for example, diary studies of older adults' interaction with the aforementioned applications – in order to obtain several indicators of how older adults could benefit from SNS in general, to improve their quality of life.

Also, as future work we plan to study new ways of interaction with those devices. We believe that such studies will help us understand the older adults' limitations within that scope, being able to include non-surface gestures to the interaction with tablets, as a way of providing the older adults with an easier and broader range of gestures. Moreover, we intend to understand which of the results that were obtained from our work, are also applicable for other SNS, such as Twitter or Google+. By doing so, we aim to perceive if such SNS have different characteristics, as well as getting to know if a novel type of mechanism could be or should be used, in order to make them more usable and accessible for older adults.

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